

OBSERVATIONS

ON THE

S C U R V Y;

WITH A REVIEW OF THE

O P I N I O N S

LATELY ADVANCED ON THAT

D I S E A S E,

AND A

NEW THEORY DEFENDED,

ON THE APPROVED METHOD OF CURE, AND THE
INDUCTION OF PNEUMATIC CHEMISTRY:

BEING AN ATTEMPT

TO INVESTIGATE THAT PRINCIPLE IN RECENT
VEGETABLE MATTER, WHICH, ALONE, HAS BEEN
FOUND EFFECTUAL IN THE TREATMENT OF
THIS SINGULAR DISEASE; AND FROM
THENCE TO DEDUCE MORE CER-
TAIN MEANS OF PREVENTION
THAN HAVE BEEN ADOPT-
ED HITHERTO.

II. EDITION.

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OF EDINBURGH; AND SURGEON OF HIS MAJESTY'S SHIP THE DUKE.

*Multum egerunt qui ante nos fuerunt; multum etiam, adhuc restat operis,
multumque restabit.* SEN. EPIST.

L O N D O N:

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M.DCC.XCII.

Nathaniel Kittall Bordenman M.D.
Surgeon R.N.



TO THE RIGHT HONORABLE

RICHARD, EARL HOWE,

ADMIRAL OF THE FLEET.

MY LORD,

WHEN I did myself the honor to solicit your patronage to the first Edition of these Observations on the Scurvy, it was from a real conviction that they might

might be of some benefit to that department of the public service, over which your Lordship then presided as first Lord Commissioner of Admiralty. About that time a dispute had arisen among physicians concerning the Theory of Scurvy, which, I believe, to this day, though variously supported, has been undecided. But the opinions of some Authors, who have interested themselves in that discussion, appeared to me as introducing a method of treatment in the disease, not founded on proper

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per notions of its nature, and by no means sanctioned by experience. It, therefore, became the duty of those whose practice had taught them to think otherwise, to guard against hasty conclusions, however plausibly defended; and I feel much satisfaction in having directed my attention to an inquiry so important.

What may be considered as original in this undertaking, is an attempt to reconcile what has been called the Theory of the Disease
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with the general and approved method of cure; or, literally, to explain those properties of recent vegetable matter, which restore to the body the principle that had been abstracted by the sea diet, or other causes of Scurvy. To the labours of modern chemists we are indebted for this explanation. With regard to the Prevention and Cure, if little is added to what was known by our predecessors, I have endeavoured from the general stock of facts on the subject, to point out a better mode of investigation than has been done hitherto. On the whole,

DEDICATION.

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whole, much is left to future observation; we ought not yet to be satisfied with our knowledge of Scurvy; for in this, as in many parts of medicine, the wisest and oldest will be still at school.

That you may long enjoy health, and continue an ornament to the British Navy, is the earnest prayer of,

My Lord,

Your Lordship's

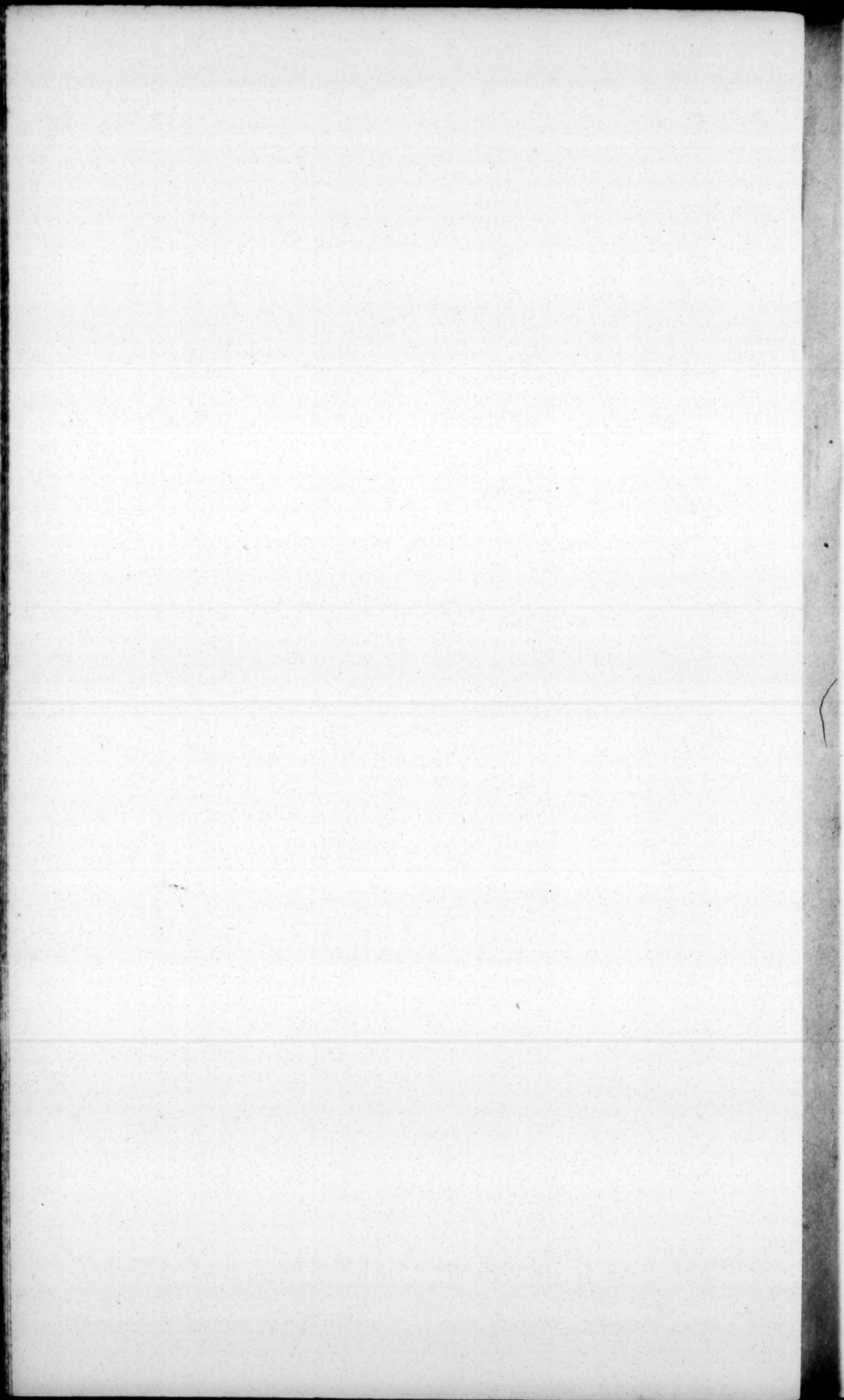
Most obedient,

And devoted humble servant,

THOMAS TROTTER.

DUKE, Portsmouth Harbour,

Jan. 12, 1792.



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INTRODUCTION.

WHEN I was attending Lectures at Edinburgh, in the winter of 1784-5, the doctrine of Putrefaction in the human fluids, the last remnant of a Humoral Pathology, was at this time the general subject of discussion in the different Medical Societies. Dr. Milman's Enquiry had been lately published, and the Thesis of Dr. Ferris, who opposed the new doctrine of debility, and contended for the putrescency of the blood, had been printed only the September before.

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The opinions of Dr. John Brown were now in their full vigor, and ably defended by some ingenious young physicians then students at the College. This doctrine, the rival to that of Doctor Cullen, more suited to captivate the imagination than to inform the judgment, was also better adapted to dazzle the fancy of a speculative mind, than to clear the doubts of the practical physician. To the student it was fascinating, simple, and complete; but the impossibility of reducing its precepts to sick-bed experience, made the deliberate observer of facts cautious of its application. Men accustomed to see the futility of reasoning on medical subjects, where it aspired beyond bounds, could not fail to be suspicious of so much self-sufficiency, when they saw the most sanguine of its followers now and then alarmed at the aggravation of a symptom or disappointed in a cure: by aiming at too much it lost every thing. Though
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the Author was himself well versed in the sister sciences of medicine; he not only disclaimed their assistance but despised their utility: such didactic harangues from the mouth of a teacher, were considered as heresies in physic, and outrageously absurd. Satisfied in his own opinion, that he had reduced a conjectural art to a demonstration, he mocked the pious delusions of antiquity; and fulminated from his desk, his dogmas of proscription against the whole faculty of medicine: it was in these rapturous excursions of his enthusiasm that he consecrated himself the priest of Apollo, and dealt from his tripod, the benediction of *age et vince* to his pupil, when he ought to have said, "*parce puer stimulis.*"

Many parts of the new doctrine, however, are secure from censure: where the exuberance of genius did not betray him into faults, he successfully ridiculed the technical iniqui-

ties of fastidious professors; but though he could occasionally point the shafts of satire with dexterity against the opinions of a literary adversary, yet he wanted the virtues of prudence and moderation to improve his victory. It was the triumph of a school-boy, and unworthy of a philosopher. He will have the credit of introducing into the practice of physic a more liberal use of stimulants, and the more general exhibition of active remedies than any of his predecessors. As he founded his system on that of Dr. Cullen, so he excluded from it some imperfections that have been said to disfigure its cotemporary; and had it been broached with as much diffidence, and defended with equal modesty, it would not have failed to extend the fame of its Author, as it would itself to the benefit of mankind. It remained for a long time inaccessible, even to the learned, from the affected Latinity in which it was delivered; and it was not till a short

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short time before his death, that Dr. Brown was obliged to descend from quaint superlatives and obsolete verbals to modern English.

The illustrious physician who now fills the practical chair of Edinburgh, will, it is hoped, rescue from oblivion the unexceptionable parts of the new doctrine, both as useful and ornamental to science.

Doctor Milman's publication was looked upon as an accession of strength to those who opposed the tainted state of the blood as the proximate cause of scurvy; but it was also looked upon and claimed as the offspring of the Brunonian doctrine. Dr. Cullen, though he had seen as little of the disease as Dr. Milman, could not be prevailed upon to relinquish all at once the only share of the Humoral Pathology which his system retained. If he was misled,

led, it was certainly from the erroneous records of writers on the subject.

The history of this great man's opinions, forms an important epoch in medicine and philosophy. Nor merely because his doctrines achieved a revolution in medical science; but "*nul-
lius in dictis jurare verba magistri*," he taught us how to think for ourselves, pointed out a method of investigation unknown to our predecessors, and seemed to have been the first Physician who received nothing gratuitously, or what was not supported by rational induction.

Possessed of a genius quick of apprehension, original and universal, he seemed formed by nature for the study and practice of an art, that must ever in some degree be conjectural, where so large a field is left for ingenuity to explore; and for the knowledge of which, a thorough acquaintance

quaintance with the auxiliary branches of science is so highly necessary.

A mind so richly endowed, soon perceived the imperfections of the reigning systems of Physic; and his first Clinical Lectures in the Royal Infirmary of Edinburgh, staggered the faith of those Physicians and Professors, who thought that the doctrines of Boerhaave could neither be refuted or admitted of improvement.

This arduous task he lived to accomplish.— Hoffman had before said, that universal Pathology was to be more certainly and easily explained,—*ex vitio motuum, micro-cosmicorum in solidis quam ex variis affectionibus vitiosorum humorum*; on which Dr. Cullen founded his principles, and hence the overthrow of the Humoral Pathology.

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It was left to him to finish the work, to beautify the whole, and polish it into system: and while the disciples of the Boerhaavian school were accumulating suppositions on *lensor* and *acrimony*, and straining facts to confirm the doctrines of their master, the spirit of Cullen arose. Bold, acute, penetrating, and comprehensive; fraught with all the resources of originality, to correct prejudice, develop error, or enlighten discovery, he trod beneath him the dominion of authority, that subdued the energy of enquiry: not like the plodder in science, he selected only from the labor of ages, what was suited to the dignity of his subject, and the greatness of his purpose; and finally, he turned the tide of searching for the proximate Causes of Diseases from the fanciful hypothesis of a depraved state of the fluids, to its proper channel,—the more rational and refined investigation of a vital principle, and the primary moving powers

powers in animals. Before he came to the practical chair, he had been Professor in all the other branches of medicine; and what he says of Boerhaave may be well applied to himself;— he excelled in each, and was certainly a candid and genuine *eclectic*.

In the exercise of a profession, where genius alone can be successful, and which no rules can supply, the vigor of his judgment and solidity of his understanding were singularly conspicuous. It was that accurate collecting of symptoms, that acuteness of apprehension, which, as if by intuition, caught the leading features of his patient's constitution and disease, that in forming a prognostic, so often the bane of medical reputation in private practice, he was seldom mistaken. But amidst all these splendid talents and transcendent abilities, the philanthropy of his heart, and the urbanity of his manners, will be

long remembered by his numerous pupils. As long as his health permitted, a day in the week was set apart for conversing with students; in this, perhaps, we see an exalted character in the most amiable point of view, where the austerity of the preceptor is laid aside to communicate knowledge through colloquial society. He studied the profession, as he said, *con amore*, and he rejoiced to inculcate the love of it in others: by these means he became the favourite Professor, and darling among students; witness the affectionate addresses from the different societies when he resigned the practical chair, and the eulogies on his character to be found in the Inaugural Dissertations of his pupils.

In medicine, changes and revolutions may be progressive; but the outlines of his system will remain, whatever may be added from the induction of fresh facts and experiments. The
love

love and ardor of the study which his example has excited, will be long preserved in the Royal Medical and Physical Societies, and will descend to posterity. The tyro in the art will there find his labours encouraged and stimulated by the freedom of debate; and the young physician who delivers his opinions with candor and modesty, will be heard and approved, in spite of the captious petulance of his senior, who, grown grey in error, too often despises conviction from a youthful opponent.

Hearing at this time so much said on the subject of Scurvy, a disease that I had lately treated in a multitude of cases, I began to think that there were many valuable facts in my possession that might go a great way in deciding the dispute; I was, therefore, induced to put some of my remarks together, and when Doctor Cullen, in the course of his lectures, came to treat on

Scurvy, a copy of them was transmitted to him, with the name of the author, according to custom: on receipt of them, he was pleased to declare next morning, "That he never came to
" that chair so badly prepared; that after the
" Scurvy had been treated by different authors
" for two hundred years, he doubted much if we
" had yet acquired a stock of facts sufficient to
" enable us to form proper notions of its nature;
" but that he would consider a paper on
" the subject which he had received from a gentleman present, which was the cause of him
" making this declaration." He, however, resumed his lecture the day following without taking farther notice of my letter. What had particularly excited his surprise, was the disease occurring among Negroes in an African ship while living on a vegetable diet of unfermented *farinacea*, which he found not to be easily reconciled to his opinions on the proximate cause.

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These cases were new to both sides of the question, and certainly offer some of the strongest facts against the doctrine of the solids.

The Declaration from Dr. Cullen, nevertheless, prompted me to arrange the matter in some methodical order, which was accordingly done in a form intended for the discussion of the Medical Society. In nearly that form it was afterwards published; it not coming to my turn to furnish papers for that season. The supporters of the Brunonian doctrine, then in the Society, were some of the most distinguished for abilities that had ever been educated at the Medical School of Edinburgh; but the flight of genius carried them beyond a cool and deliberate investigation. It sounded strange in the ears of a navy surgeon to hear that the scurvy could be best cured by a diet of solid animal food, brandy, and opium. But besides their own plausible reasoning on
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the subject, they produced the best authorities for these modes of practice; and the debility of the digestive powers, with deficient nourishment, as held out in Doctor Lind's Treatise on Scurvy, were considered as the standard of truth, and the umpires of dispute.

This worthy man and learned physician, had been a surgeon in the navy himself, and seen the disease, as it is usually met with in ships of war in all circumstances and situations. The leading *trait* of his professional character has marked him the man of observation. When he first published his book, he had, no doubt, many authors to consult; but their facts were often distorted, their theories absurd, and their practice empirical, so that much was left to himself; and when he came to be a physician to Haslar Hospital, he seems to have soon formed his opinions. Of great medical abilities that have
attended

attended military services, the army of this country can boast of a Pringle, a Cleghorn, and Munro, and some others who have written since last war; but the name of Lind stands alone in the navy. Amidst the few advantages his situation afforded him for study, the spirit of observation never forsook him; and his works comprehend the best history of climate that has yet been produced.

What is to be offered in these Observations against the opinions of Doctor Lind, ought to be considered as the result of a larger stock of facts, accumulated on the subject of Scurvy since his publication. "In every branch of science, says Dr. Cullen, with respect to which new facts are daily acquired, and these, consequently, giving occasion to new reflections, which correct the principles formerly adopted; it is necessary, from time to time, to reform

“reform and renew the whole system, with all
“the additions and amendments it has received
“and is then capable of.” The necessity of recording facts must be obvious to every one. The first edition of this work was printed in the end of 1785; but written at a period of life when few people think of giving their opinion on practical subjects in medicine; it contained many of those errors, which follow the ardor of juvenile inquiries; and which now, from more experience and reflection, I shall not hesitate to retract as occasion may offer. The facts, however, as there related, have been thought no inconsiderable acquisition to our knowledge of Scurvy; a late writer on the disease had found some parts of it so much to his purpose, as to borrow a few pages, without allowing me the credit of an *inverted comma*.

Many alterations with a considerable number of recent facts are added in this second edition.

In

In the former I found the doctrine of putrefaction untenable, and in this I have deserted it altogether. This being the case, my arguments are much extended against Doctor Milman's conclusions; and a new proximate cause defended on the approved method of cure, and the induction of pneumatic chemistry, is, for the first time, offered. It may perhaps be said that theories in medicine are only innocent reveries; for it is enough if we can cure a disease: such reasoning needs no serious reply; the human mind, in all ages, has been desirous of investigating causes where it saw effects. But if ever there was a necessity of deciding any point in medical controversy it is the one at issue among us: let us only suppose a young man just come from the University, where he had taken the opinions of Doctor Milman for his guide in the treatment of Scurvy.—He had been there taught that Scurvy at sea is caused by an indigestible

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diet,

diet, which by affording no nourishment to the body, reduced it to a state of debility which produced the disease. If these were the ideas he had formed, instead of having recourse to the juice of lemons, other acid fruits, or any fresh vegetables, he would immediately prescribe, if it could be got, animal food, wine, and other restoratives; none of which, we know, can cure the Scurvy; but these articles he had been taught, were the best to restore a debilitated stomach and constitution. This reasoning is not mere allegory, for it has been often made use of. Such notions ought, therefore, to be corrected at once; for it is well known with what reluctance many of us part with opinions we had formed early, and been accustomed to revere. I thus contend for the importance and propriety of the discussion which I have provoked, and shall preserve my opinions as long as I am convinced by matter of fact only. The
theory

theory which is here offered will have to recommend it, that it holds out no new method of cure, supported by partial observation; but tends to confirm the old, and lead the way to a more certain practice than has hitherto been done. What has been said on the Prevention as well as Cure, we have endeavoured to explain as much as possible, in order to render the whole of practical utility. It is the spirit of true philosophy to deduce every thing from fundamental principles, and to advance nothing that cannot be defended on these. We have had recourse to modern chemistry in many of our explanations, and have employed it in a manner entirely original and new to the doctrines of Pathology and Therapeutics. The present æra of chemistry has unfolded a treasure of knowledge, at which the philosophic mind is astonished, and the ardor of enquiry and experi-

ment is only to terminate with the remotest arcana of natural bodies.

As I still consider the subject incomplete, those gentlemen who will favor me with any communications from their practice in the disease, will much oblige me. Doctor Lind, to whom these addresses were formerly so justly due, is now so enfeebled with age, that he cannot give them that attention he could otherwise wish. At a future period I hope to be able to add some valuable information from the Settlement of New South Wales, and the ships that are gone on discoveries.

Many apologies are wanted for the inaccuracies in both matter and language, which may have escaped me in this Work. In a situation so liable to interruption, it is in some measure
unavoidable

unavoidable. At a distance from a well stored library and literary friends, it will not have the advantages which usually accompany publication: it can only derive credit from the facts it contains.

The Author of these Observations at the end of the last war, by no provision being made for the junior part of the Surgeon's List, was the first man of his *corps* who had to embrace the painful alternative of embarking on an African voyage. Much of the information contained in these pages, was the result of his practice in that voyage: to find that it is of any service to medical science, will, in some degree, repay him for the unpleasant months he spent in the unhallowed trade; and the sufferings of his constitution from an unwholesome climate. Since that time it has been peculiarly his province

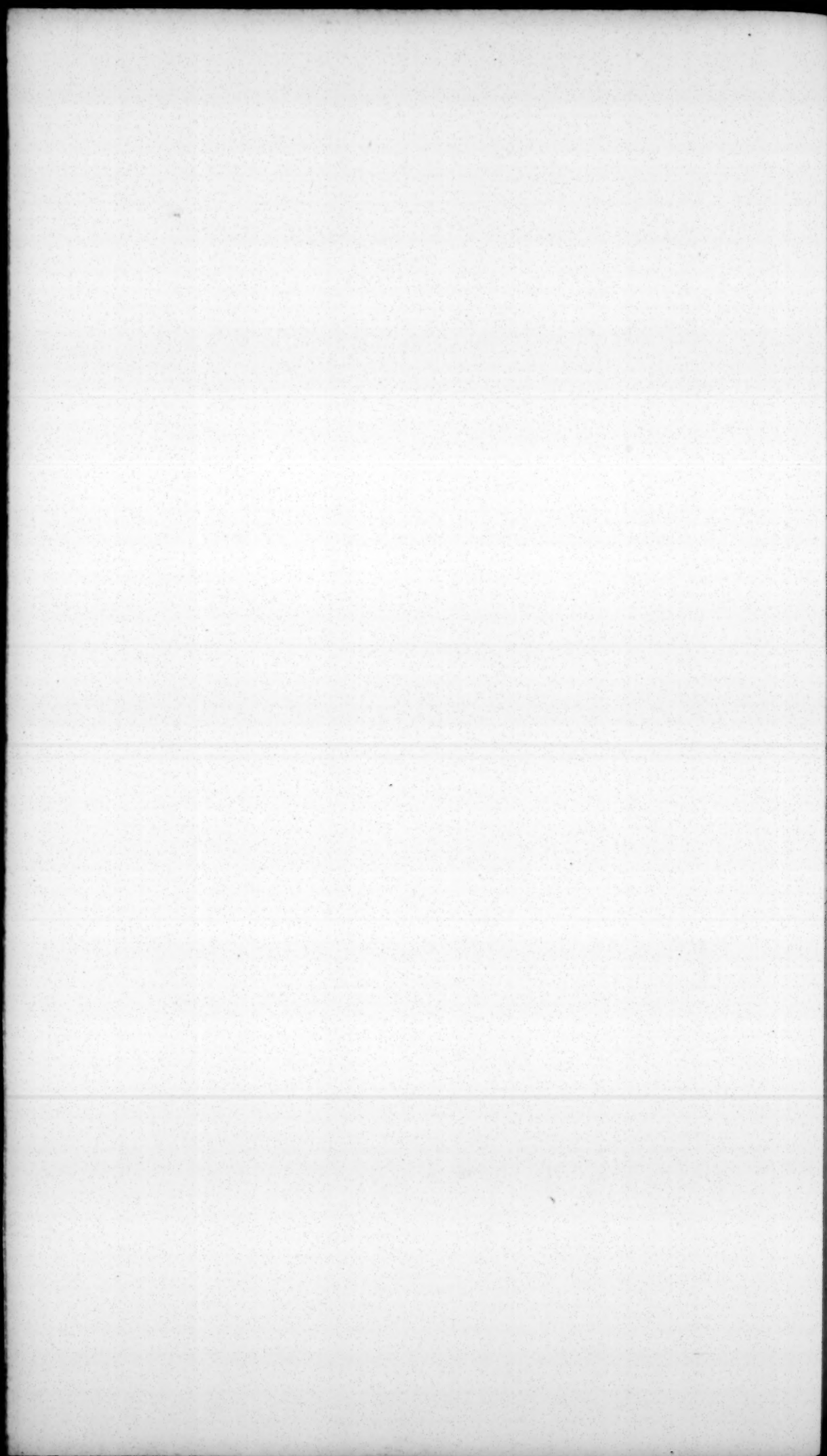
vince to explain to the first Lord of the Admiralty, the imperfections of the medical establishment in the navy; not merely in point of emolument to the surgeon; but in serious circumstances that relate to the health of seamen, and which call for a general reform on the principles of modern improvements in medicine. The Author is happy to acknowledge the approbation which the tribunals of literature bestowed on his plan. It was certainly remarked with much justice, "The medical department in the navy, although it speaks but little in the praise of the wisdom of those who planned it, is certainly an excellent proof of the patience of their posterity, who have so long suffered it to remain unimproved. It was bad at its first institution, and has been gradually growing worse." * Whatever may be elsewhere the success of an attempt to reform the medical de-

* Monthly Review for June, 1790.

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partment of the navy, it is no small satisfaction to think that it has been favourably received by those who have some pretensions to decide in subjects of science.—

Sic me servavit Apollo!



OBSERVATIONS

ON THE

S C U R V Y.

SECTION I.

THE HISTORY OF SCURVY.

THE History of Scurvy, like that of many other diseases, is still imperfect and obscure; and it is, perhaps, more a matter of curiosity than of any real practical utility, to inquire and decide, whether it was known and described by the ancient physicians. Much
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learning and extensive knowledge of the writings of antiquity, have been bestowed on this subject; but though the arguments deduced from them are specious, they are not convincing and satisfactory. It is a supposition too fanciful for medical reasoning, to reconcile the *Splen Magnus*, and *Convolvulus Sanguineus* of Hippocrates, with what is called the Scurvy. Certainly, bowel complaints are not essential attendants of Scurvy; and those symptoms by which he describes the affections of the spleen, are vague and inconsistent. Although the disease has been produced in every climate from almost the same causes; yet, assuredly, a warm latitude, where vegetation is neither checked or destroyed by the frost of a severe winter, but pours forth her abundant luxuriance throughout the year, would be equally favourable for the prevention, as it is known to be for the cure. Thus it is not likely to have ever made its appearance in the Southern climates of Europe: these regions all abound with the acid fruits, which are the best antiscorbutics;

antiscorbutics; and the cravings of nature in this disorder are so strongly marked, that so accurate an observer of the propensities of appetite as Hippocrates was, could never overlook such longings and desires in his patient, had he ever seen the Scurvy. These arguments all operate against the conclusion, that the disease was known to the Greek and Arabian physicians. Hence, in latter times, the first accurate accounts of its causes and appearance, which are to be met with, are from the shores of the Baltic, where the inhabitants were obliged to live very much on salted fish and beef, and where their vegetables used in diet were destroyed by long and rigorous winters: the same causes continue to produce Scurvy in these cold countries to this day. But as Commerce began to expand her wings, and a new world was discovered, sea voyages became longer, and more unhealthy. The nations of Europe, particularly the French, Spaniards, and English, have of late made their trans-atlantic possessions the scenes of their

warfare. Thus, all those powers have occasionally kept up vast armaments by sea and land, for the defence of their colonies; and from the necessity of supplying their seamen with salted provisions, without vegetables, the Scurvy has been the most constant disease and fatal attendant of a sea life during every war. From these sources we have derived our present improved state of knowledge concerning it; and Doctor Lind's Work will remain a valuable legacy to the naval service of Great Britain, as it will be a lasting monument of the Author's industry and abilities.

The meaning and derivation of the word itself, have also attracted much attention from the favourers of its antiquity. I am perfectly of opinion with Doctor Lind concerning its Slavonic origin. The first accurate account of the disease certainly came from the northern countries of Europe; from which we are led to believe, that there also it acquired the name
that

that it still bears. What value the authority of antiquity may confer on the History of Diseases is not to be disputed here; but the labours of these gentlemen seem to have been as much misapplied, as those of others were, in exploring the *Herba Britannica* of the Roman Naturalist, (celebrated for having cured the disease in the Roman army); for we do not find in the writings of the ancient physicians, any thing worthy to be sought after, either in the history of the symptoms, or cure of Scurvy.

Modern Nosologists have been at much pains to give us a clear DEFINITION of *Scorbutus*. Doctor Cullen adopting the idea of its being only found in cold climates, begins with the words "In Regione frigida." This ought to be left out; cold, no doubt, assists the operation of the exciting causes; but it is now well known that Scurvy is to be met with in every

every latitude. He goes on, "post victum
 "putrescentem, salitum ex animalibus confec-
 "tum." The Doctor was of opinion that
 Scurvy only followed the use of salted pro-
 visions, or even animal food without fresh
 vegetables. There are many cases on record
 where the disease followed other kinds of diet.
 It is a very common complaint in the country
 ships in the East Indies, where the religion of
 the natives obliges them to live at sea on rice;
 but they are always recovered by fresh fruits
 when they return to port. In these Obser-
 vations we shall add many cases, from similar
 causes, to confirm the same thing. The fol-
 lowing definition is offered as being agree-
 able to our present state of knowledge con-
 cerning the remote and occasional causes:—

*Asthenia, stomacace, in cute, maculæ
 diversicolores, plerumque livescences; defi-
 ciente simul vegetabili materie recente, eun-
 demque vehemente ingerendi desiderio.*

Many

Many species and subdivisions of Scurvy are to be found in the writings of physicians, which originated in the imperfect chemical knowledge of the animal fluids; and the pretended causes vaguely assigned for its production in the earlier records of medicine; but these are inconsistent with modern Pathology, and our present ideas of the animal œconomy. We are now well assured that there is but *one Scurvy*; the same in its symptoms, however, at different times variously produced; and the same method of cure is equally to be pursued, whatever were its causes.

In enumerating the *remote causes* of Scurvy, authors have very generally divided them into occasional and predisposing. From the remarkable circumstance of this disease occurring after the use of a peculiar kind of diet, Doctor Cullen has aptly termed the occasional causes the antecedents of Scurvy.

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This disorder is most frequently met with at sea: few ships in any climate, after being eight or ten weeks from port, escape the Scurvy, if the crew are obliged to live on the common allowance of salt provisions, with no fresh vegetables. Certain predisposing causes, however, concur to hasten the appearance of its symptoms. At land it is also produced by the same means; and besieged garrisons on many occasions have suffered extremely from this complaint; such was the case with Fort St. Philip at Minorca, and that of Gibraltar, while blockaded by the Spaniards last war. But it is particularly owing to the scarcity of *recent vegetable matter*; and where it abounds the disease is unknown.

Among the *predisposing causes* are chiefly to be remarked; damp, marshy situations, fogs, or rainy weather; cold weather from climate or season. At sea those particularly liable to it, and whom it generally affects first, are seamen
weakened

weakened by preceding disease, and in a convalescent state too soon put upon the common allowance of the ship. The lazy, inactive, and slovenly people, called the skulkers, become the certain prey of the Scurvy. Thus it is that impressed men, and raw landmen are so early affected. Fatigue from whatever cause; hence its appearance in our ships of war, is often after hard gales of wind, where the crew had been much fatigued with the necessary duty on deck during tempestuous weather. Persons of what is called the melancholic temperament are peculiarly predisposed to Scurvy whenever exposed to its exciting causes; and if it is true that hypochondriacal affections are confined to that temperament, we may allow some excuse for authors having now and then confounded them together: in such constitutions, the symptoms of timidity and despondency are observed in a degree beyond common; but as far as my experience goes, without any signs of dyspepsia, which pro-

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perly

perly characterize the hypochondriacal disease. To all these causes now mentioned, is to be added impure air; and, in short, whatever can be considered as a debilitating power when applied to the human body, may be justly reckoned among the predisposing causes of Scurvy.

In forming a *Diagnosis* of Scurvy there is but little danger of confounding it with any other disease. The preceding kind of diet, or what is called the antecedents; the situations in which it so generally occurs, as at sea; so many symptoms peculiar to itself, and the definition we have given it, will all serve to direct the practitioner in forming his diagnostics.

Different species of cutaneous eruptions, even among medical men, still pass for scorbutic, as being peculiar to certain constitutions: they are however, of a very contrary nature; such a term as a *scorbutic habit* is founded only on obsolete theories, and we hold it altogether fanciful.

As.

As a methodical plan has been adopted throughout this Work, in narrating the symptoms, I shall divide them into two stages; the mild and inveterate: the *incipiens et inveteratus* of authors. Doctor Lind has an intermediate degree, for the purpose, as he says, of relating those that are more casual; proceeding not so much from the genius of the distemper, as from other circumstances. I shall not, however, attempt to explain any symptom that may be said to arise from *idiosyncrasy*; at best, it must be conjectural; for no part of the animal œconomy is involved so much in obscurity as these causes which modify their operation with such variety in the same diseases, in different persons.

I. It is, I believe, very generally remarked in a long voyage at sea, when the stock of vegetables is consumed, that there is a constant craving and longing desire for fresh vegetables, particularly the acid kind, for pure water, and

independent of the anxiety which may be excited by the wish of accomplishing the business of a voyage, there seems also a desire of being on land, and is connected with a state of body at the time. I have uniformly observed it the harbinger of Scurvy. Dr. Lind, in some part of his Work, has mentioned this circumstance; but I consider those longings as the first symptoms and the constant attendants of the disease in all its stages. The cravings of appetite, not only amuse their waking hours, with thoughts on green fields, and streams of pure water; but in dreams they are tantalized by the favourite idea; and on waking, the mortifying disappointment is expressed with the utmost regret, with groans, and weeping, altogether childish. It is curious to hear them in conversation with one another on these subjects; I have remarked it as earnestly conducted, as we sometimes observe hypochondriacs in relating their feelings, from any ruffle of temper occasioned by changeable weather, or other slight causes. When I
heard

heard a sailor expressing these desires, and lolling in corners from the sight of his officers, there was always an expectation of his being added to the list of scorbutics in a few days. This scorbutic Nostalgia, "*in absentibus a patria, vehemens eundum revisendi desiderium,*" belongs to the second species of Doctor Cullen's Genus.

About this time the colour of the face is changed, and even other parts of the skin grow fallow; the cheerful look of the eye, puts on the dull heavy melancholy, and the whole countenance is, as it were bloated. An universal lassitude prevails not to be refreshed by sleep; feebleness of the joints of the knees and arms; pains all over the body, often worse in bed, particularly in the shin bones, which resemble venereal pains. The patient if he attempts to do any thing is soon fatigued; he grows inactive, his spirits flag; he flies into hiding places from his duty, broods over his own feelings in solitude, and indulges the most gloomy

gloomy ideas of his safety, as if hypochondriacal. To these symptoms generally succeeds the softness of the gums, which so especially characterises Scurvy; they swell, grow spongy, and bleed from the slightest cause. The breath is foetid and disagreeable, and often attended with some unpleasant taste of the mouth. The surface of the body is dry and rough to the touch, the pores of the skin are evidently constricted, and the patient feels the external air colder than usual. Some degree of tightness is felt about the breast; a difficulty of respiration also takes place on using exercise, but commonly inconsiderable in this stage.

All the symptoms now mentioned, in some cases increase rapidly; while in others they make little progress even for weeks: but this depends on the state of the body, and the nature of the diet in use; nor are they by any means regular in succession. In one person it shall be first known, from the surface of an ulcer being covered

vered with a portion of crassamentum, which is soft and fungous, and on being separated a similar substance is shortly produced: the sailors call this spongy mass the *bullocks liver*, which it resembles in colour and consistence. In other cases we see it begin, with swellings of the lower extremities, which retain the impression of the finger: sometimes a hardness of the muscles will appear before any other sign of the disease; particularly a degree of rigidity and contraction of the hamstrings. This symptom often deprives the patient of the use of his limbs, and will remain in some cases for weeks after every complaint has disappeared. The Scurvy however soon expresses itself by its more general attendants, as the livid spots, bloated looks, spongy gums, &c.

II. As the Disease advances, the lassitude, languor, and debility become more considerable; the pains in different parts of the body more severe. The respiration is oppressed on the slightest

flightest exertions, with a proneness to faint in an erect posture, and on being exposed to air colder than the temperature they had just before breathed. It is not uncommon for sailors affected with Scurvy to walk upon deck, and drop down irrecoverably; though to outward appearance when below there seemed no danger. A carpenter's mate in the Berwick, got out of his hammock without any assistance; while putting on his jackets as he stood, he grew faintish and fell down: the people about him instantly opened the port, as they thought, to give him free air, when he immediately expired. The fetor of the breath now becomes intolerable: pieces of the gums, or cloats of blood, like spongy flesh, fall out of the mouth: the teeth are loosened in their sockets, and frequently drop from the jaw bone, while the patient is eating: as the gums decay a salivation comes on. The spots on the skin increase rapidly in size, and their colour is variously modified, from yellow to a livid hue, by effusions of blood in the cellular texture.

texture. Every slight scratch or division of the skin, is apt to degenerate into a foul ulcer, and old cicatrices are apt to break out afresh. Hemorrhagies are now frequent from different parts of the body; but particularly from the nose, or from the ulcers: though the loss of blood has been small, there are many instances, where it seemed to hasten the death of the patient, which has happened immediately after.

The belly is generally costive; but diarrhæas, and even fluxes are not uncommon. The urine, as might be expected, is highly coloured; the disease, in its most inveterate degree, happens when water is scarce; therefore, for want of dilution, the urine is small in quantity, and acrid. Nothing satisfactory is to be learned from the state of the pulse; but is often to be felt regular a very short time before death. The mind in the beginning as has been remarked, and throughout the disease, is timid, anxious, and desponding; but towards the fatal period, there

is generally a total indifference and seeming torpor of every faculty. The appetite for food in every stage of Scurvy is seldom impaired; the patient has been even known to expire with the bite in his mouth.

Such is the History of Scurvy, as it generally makes its appearance in his Majesty's ships of war. I shall now describe the disease, as it broke out on board of a slave ship, attended with many singular phenomena never before related; which shew in an emphatic manner, under what unfavourable circumstances the unfortunate Africans are exposed to the horrors of disease, and confinement on ship-board.

About the beginning of June, 1783, the Guineaman, of which I was surgeon, failed from the port of Liverpool. After a favourable passage of little more than a month, we came to anchor at Cape La How, on the Gold Coast; having buried a sailor who died of the small pox,
a dan-

a dangerous distemper in a slave ship; but by taking proper precautions, and throwing every thing over board which belonged to him, the infection only extended to one black man, a passenger, who was confined in the long-boat till he recovered. No ship had opened trade here since the conclusion of the war; so that in the space of a week, we had bought more than an hundred prime slaves, young, stout, and healthy. This was thought a lucky beginning; but when we came to Anamaboe, the trade was scarce, and the price of slaves very high, from the number of vessels then lying in the road, which were eight or ten. So slow was now our purchase, that in February we had not got on board two-thirds of our complement.

About this time it was remarked, that the slaves bought at Cape La How, were growing exceedingly fat. On this account it was recommended to the master of the ship, to allow them more exercise, and reduce the quantity of diet,

which had hitherto been too much from a mistaken notion that it would strengthen them the more, to bear the passage to the West Indies. Their food consisted of beans, which were brought from England, and rice and Indian corn, which were bought on the coast. These articles were boiled to the consistence of a soft paste, and made as near as possible like the food of the country by the addition of palm oil, Guinea pepper, and common salt. A crew which held from fourteen to sixteen quarts of this composition, was served to ten of them twice a day: they were allowed to drink what water they pleased; but, from being confined below, about sixteen hours out of the twenty-four, and permitted no exercise when upon deck; it was easy to foresee that they could not long remain in a healthy state. Such, however, was the obstinate and conceited ignorance of the master of the vessel, that this treatment was still persisted in; the food was continued in the same proportion, till you would have thought that some of them,

them, with much difficulty walked along the deck. And, though a certain number might have been unfettered without endangering the safety of the ship, it was not attended to. The custom of dancing them round the deck to the sound of the drum, was not practiced till it was too late to be of service.

It will be proper to observe here, that these poor wretches are shackled in pairs, by the wrists and ancles; when they come upon deck, two long chains are passed through their irons at the ancle, which reach from the forecastle to the barricade, for the purpose of confining them to one spot. The rooms where they are secured below, are from five to six feet in height, according to the size of the ship; but besides the number that lie on the deck, about one half as many are stretched on what they call a platform, that runs along the sides of the vessel; raised about two feet and a half from the floor, and of breadth

breadth sufficient for the length of a man. * Here they are stowed *spoonways*, according to the technical phrase; and so closely locked into one another's arms, that it is difficult to move without treading upon them. The rooms are imperfectly aired by gratings above, and small skuttles in the side of the ship, which, of course, can be of little use at sea. The gratings are also half covered when it blows hard, to keep out the salt spray or rain. The temperature in these apartments, when they became crowded, was sometimes above 96° of Farenheit's scale. A misfortune befel my thermometer in the latter part of the voyage, so that I had not an opportunity of measuring the heat when the rooms were as full as they could hold. I, myself, could never breathe there, unless under the hatchway. In such situations it may be supposed that the

* If I am right informed, a section of this ship was laid before the Society for the Abolition of the Slave Trade; in order to calculate what space was allowed for each individual to sleep upon, when she carried 650 slaves.

sufferings

sufferings of these creatures are sometimes dreadful. Air heated and rarified to such a degree, and loaded with animal effluvia, cannot fail of being noxious to life; there were certainly instances where some expired from suffocation, having shown no previous signs of indisposition. * During the season of the year, that the ship was on the coast, there was little rain, and the weather was not more sultry than usual in these latitudes.

In this situation, things remained with us, till the beginning of March; no precautions being taken to preserve the health of the slaves; when a corpulent young Negro, complained to me of a hardness, in the *supinator radii longus* of his right arm. This hardness appeared of a very unusual kind, for it did not retain the smallest impression of the finger, or of any force which I applied to the spot. He was ordered

* Vide Doctor Trotter's Evidence on the Slave Trade, before the Select Committee of the House of Commons.

some simple liniment to rub it with; but, on examining the part next day, I found the hardness extend to all the muscles on the upper part of the fore-arm, with some contraction at the joint of the elbow, and rigidity of the tendinous *aponeurosis* of the *biceps flexor cubiti*. None of these parts, however, were very painful, or the least increased in size. In this manner it gradually spread up the arm, and shoulder, over the muscles of the neck, those of the lower jaw, producing a *trismus*; from thence to the chest and abdomen, till a spastic rigidity seemed to pervade every muscle of the trunk and extremities.— About the time that the muscles of the neck became affected, a stupor came on; and while he retained the use of his left hand, he employed himself in picking sticks or straws from the deck, as people do the bed clothes in a state of delirium. The eye which was bloated, was now fixed, and constantly open; the tongue was locked between the teeth and lolled out at the one side of the mouth for three days before death.

death. In this case the warm bath was tried, and persisted in, for some time, but without effect: and when endeavouring to force the jaw open, to pour some medicine into his mouth, the gums were perceived to be spongy, bleeding, and part of them falling from the teeth in black masses, many of which were loose: the feter of the breath was also extremely disagreeable.*

There now remained little doubt that the disease in question was Scurvy; though I could by no means reconcile circumstances to any thing I had either read or seen of it elsewhere.

It became, of course, a matter of serious importance to investigate the causes of this singular distemper, and to counteract them in some manner so effectually as to secure those that

* From all my enquiries among both white and black people, I was not able to learn, that such a disease as Scurvy, was ever seen among the natives of Africa on shore; but I verily believe that it has occurred more frequently in slave ships, than has been suspected.

were healthy. It soon struck me that the unwieldy corpulency of the Negro who had just died was very probably the cause of the complaint. The fattest slaves were accordingly selected, and separated from the rest; upon examining them attentively, the muscles on different parts of the body, but particularly of the extremities were affected in various degrees, with that singular kind of induration described in the preceding case. Their gums were all affected; some of them bleeding; pieces of spongy flesh were seen sprouting from the roots of the teeth: what black people consider as the most unseemly disfiguration, a few had lost several of their teeth. Pains and weakness of the limbs were general; tightness and oppression about the *præcordia*; disagreeable smell of the breath, &c. A particular sluggishness and dislike to motion, or being spoke to, were observed in a few; and whenever they lay down, they fell instantly into a sleep, from which it was difficult to rouse them. Wherever there were sores on any of them,

them, the surface was covered with the black cloat of blood, and the thin discharge which distinguish all scorbutic ulcers. Instead of any hardness, however, two or three had œdematous swellings in their legs, to a very considerable degree, and retaining the mark of the finger for a long time after they were prest. The ulcers were apt to bleed on the slightest irritation, if the disease had made some progress; and also hæmorrhagies from the nose, and purgings of blood. * But in the advanced state of the disease, the disposition to sleep seemed to be one of the most unfavourable symptoms; it was constantly changed to a coma and delirium; and none but one with this symptom ever recovered. Contractions of the elbow as well as the ham were common; but the colour of their skins prevented the livid coloured spots from being seen distinctly, as in white people. Loose stools were

* The blood which flowed from the hæmorrhagies was always of a colour darker than usual, and when cold, only formed a partial coagulum.

frequent, and with severe griping. These complaints are very common in slave ships; but ought rather to be called diarrhæas than fluxes, which are sometimes combined with the Scurvy, and said to be more often associated with it than other distempers.

The pulse seemed no index to the state of the patient, at least, no general conclusion could be drawn from it. The appetite continued natural to the last, and some of them expired while eating their victuals round the mess crew.

This disease was for some time confined to the slaves that had been longest on board, but particularly to the most corpulent, who had taken the least exercise: so general was this observation, and so fully was I confirmed of it, that when a Negro was becoming rapidly fat, it was no difficult matter to determine how soon he would be seized with the Scurvy. Thus it spread among them by hasty strides, till it
shewed,

shewed, in different cases, every symptom mentioned by writers on the subject.*

When it came to affect more than those of the first purchase, I could plainly perceive the natives of some countries much more liable to it than others. These were the *Duncos*; a people rather of a fallow complexion than black, a heavy dull look, stupid, inactive, and gloomy turn of mind. While the *Fantees*, who inhabit near Cape Coast, are preferred to all other natives of Guinea, on account of their genteel shape and fine black colour, were scarce at all tainted with the disease. These are a cheerful, active, lively people, and generally the first to raise mutiny in ships, or undertake any hazardous enterprize.

* Not being able to speak the language of the Africans, I did not remark the Nyctalopia, as mentioned by Dr. Blane in Mr. Telford's report. This singular symptom is however taken notice of by authors before Mr. Telford observed it in the West Indies; and is to be found in Dr. Hulme's Inaugural Dissertation, de Scorbuto, Edin. 1765, which he afterwards published in English.

What

What has been just now said, strongly confirms the opinion, how much pre disposition, such as depressing passions of the mind concurs in the production of Scurvy; while those of the active kind, have the happiest influence in the prevention. The difference remarked between the inhabitants of the two countries, is probably owing to the dry and elevated, or the low and swampy districts of land, where they live. Certainly, such situations, give very different characters to the constitution of both body and mind: but this is degressing from our subject. The predisposition to Scurvy must be also increased by the hardships they experience from their confinement in the hold of a ship, which, no doubt, will keep alive many of these gloomy reflections inseparable from a state of captivity. It would be unjust to suppose that the African feels no parting pang when he takes the last farewell of his country, his liberty, his friends, and all that is to be valued in existence! This fact is supported by some cases of suicide, which
came

came under my own observation; one of which was conducted with a *stoick* enthusiasm, and plainly evinced the innate love of freedom of uncivilized beings. In the night they were often heard making very hideous kinds of moaning, something expressive of extreme affliction. This, upon inquiry, I found to be owing to dreaming of being at home among their friends and relations, and the melancholy reverse at waking, on finding themselves among their captive countrymen in the hold of a slave ship. Some of the women in these situations were thrown into violent hysteric fits.

Few of the boys had any scorbutic symptoms: none of them were shackled, and by being allowed to run about the deck, and occasionally assist in the duty of the ship, their health seemed to be preserved by the exercise. This was also the case with the women; for out of the whole number only eight were affected, and these of the *Dunco* country.

During

During this sickly state of the ship, none of the sailors were in the least tainted with the Scurvy. Their diet was the common sea fare; a little of the victuals prepared for the slaves, was generally eat, with the salt beef: they had it however in their power to barter some of their provisions with the natives for fresh vegetables. The water in use was brought from a stagnant pool at Cape Coast castle, supplied by rains, muddy, and of a very unpleasant taste. It abounded with animalcules, and is said to have the effect of producing the Guinea worm: this seemed to be the case with the slaves purchased to windward, who had no signs of the complaint till after living a few months in Anamaboe road. Some water was procured for the ship at Cape La How, but it was as pure, and kept as well, as water brought from England. The road where the ships lay at anchor is open to the sea; the land wind seldom reaches them, at least not so as to be unhealthy to the seamen, or to produce any of the effects of marsh *effluvia*; and the

the sea breeze is constant and refreshing. There were a few tornadoes during our stay, attended with thunder, lightening, and heavy showers of rain; but they never exceeded half an hour in duration. The thermometer, in the shade, at any time, scarce rose above 86°, which was in December, called the *Harmattan* season, from some very unwholesome fogs that now and then happen, and are attended with great mortality of the inhabitants.

Our situation was now so bad that numbers were daily taken ill, and others dropping off; while the master of the vessel, whose disposition and character were congenial to the trade, attributed every thing to the machinations of the doctor and devil. About the end of April, 1784, our cargo to near 650 was completed: by this time seven or eight had died of Scurvy; from eighty to ninety were already ill, and more likely to add to the number. Our stock of fresh vegetables at leaving the Coast of Africa, did not

exceed a few gallons of lime-juice, ten or twelve dozen of oranges, and some small baskets of guavas: this was owing to the master doubting that the disease in question was Scurvy, which I so confidently asserted.

After being four or five days at sea our list of scorbutics was nearly doubled; much mortality was also to be apprehended from bowel complaints spreading among them. I was now a good deal surprized to find two slaves who had not been above fourteen days on board shew evident signs of the Scurvy, such as spongy gums, pains of the limbs, tightness of the breast, difficulty of breathing, fetid breath, contracted hams, &c. In a few days after that ten or twelve more of the latter part of the purchase were added to the number. Till now the disease had been ascribed to over abundant diet, no exercise, and the want of fresh vegetables: I was also well assured that Scurvy had never made its appearance among slaves in a Guineaman sooner than

than some months confinement, so that in the present case, some other causes ought to be suspected. It is no new opinion, but remarked by some of the oldest writers, that the Scurvy is a contagious disease. This opinion was plausible, from the nature of the distemper, and the number of people afflicted at the same time. What Doctor Lind has said in opposition to these arguments is very satisfactory. Doctor Blane, in his Observations on the Diseases of the Fleet, has revived the subject of its contagious disposition; but his conclusions can scarce be admitted. Why suppose that the disease was communicated from a few men in a ship, whose constitutions were remarkably predisposed, to the rest, when they were all exposed to the same exciting causes, viz. the deficiency of fresh vegetables? We are well assured that no predisposition can beget Scurvy without the exciting cause. Where some are afflicted before others, we ought, certainly, to assign it to *idiosyncrasy*, or peculiarity of temperament,

if no external causes, such as cold, fatigue, &c. had concurred to produce it; for when the body has been subjected to the diet of which Scurvy is the immediate effect, it will make its appearance, though in a longer time, without any predisposition whatever. During the late armaments, several ships, shortly after being commissioned, received men from East and West Indiamen bad of the Scurvy; these were mostly cured on board; but none of the ships company were ever tainted by them. I am extremely unwilling to admit the contagious nature of this disease; and if it cannot be propagated that way, it is most likely that the tainted atmosphere of the slave rooms, which were now full, so powerfully predisposed those late purchased Negros to Scurvy, that the exciting cause was much accelerated in its operations by the foul air which they breathed; impure exhalations have, therefore, been deservedly mentioned by authors among the remote causes of Scurvy.

The

The small stock of antiscorbutics carried to sea being soon consumed, the state of the slaves was left miserable indeed. The decks in every corner were crowded with objects of distress, exhibiting scenes of affliction, equal to any ever recorded, of this loathsome distemper. Some were found dead in the rooms in a morning, or dropped down immediately on coming upon deck, while others expired eating their victuals, full in flesh and blood. After a few weeks passage, however, to the relief of these unfortunate wretches, and to our own inexpressible joy, we made Antigua; having buried nearly forty by the way. It is highly probable, that had the ship been ten days more at sea, half the cargo must have perished, there being, at this time, about three hundred tainted, in different degrees, with Scurvy.

Immediately on making land, the slaves were unshackled; their confinement in irons being no longer required for the safety of the crew
and

and vessel. On coming to anchor at St. John's, supplies of fresh vegetables were procured from the shore, consisting of shaddocks, lemons, limes, oranges, pineapples, &c.; these articles were served to them three or four times a day, and notwithstanding they continued their usual diet, from the time we left Antigua, till we came to anchor in Kingston Harbour, Jamaica, which was eight or nine days, there were little remains of Scurvy among them: they were now better fed, and repaired for market. The coarse joints and offals of beef were boiled among their provisions. On the week following the sale of this *cargo of human beings* opened at what was called a very high price.—Let us now turn our attention to the discordant theories of this singular disease.

SECTION

SECTION II.

THE THEORY OF SCURVY.

FROM the History of Scurvy given in the preceding pages, it appears, that it is found in very different situations ; that the diet which it follows, is sometimes of salted meats ; at other times no salt provisions were in use, but food altogether vegetable in its nature: there is one circumstance, however, to be remarked, that when it has affected a number of persons living on vegetable diet, at the same time there has always been a deficiency of *fresh* vegetable matter. Such were the cases described in the last Section. Throughout the whole symptoms of this disease, there is something so peculiar to itself, that no description, however accurate it may be, can convey to the

the reader a proper idea of its nature. It is thus, that physicians drawing general conclusions from the writings of authors, have been led to form theories very different from the real genius of the distemper, and the truth of which assertion we hope to render evident in the following pages.

It would be foreign from the purpose of our undertaking to trace the opinions of ancient writers, in attempting to establish the proximate causes of diseases on the Pathology of the fluids. Their theories have occasionally varied from the supposed elementary principles of natural bodies, to the different oils, salts, and sulphur, introduced by chemical philosophy into medicine; and which have had their share in the fashionable doctrines of the times that gave them birth.

In the System of Boerhaave, a doctrine of proximate causes is chiefly supported from the chemical changes of the blood, such as acid, alkaline,

kaline, &c. according to the nature of the remote causes. In our own times, Doctor Cullen, whose System has superseded that of Boerhaave, contends for a præternatural saline state of the fluids in Scurvy; this he supposes to be of the ammoniacal kind, evolved during the animal process in greater quantity than usual, from the abundance of marine salt taken into the body; and the provisions themselves, perhaps, in a putrid as well as a salted state.

From the most ancient writers, till within these few years, the Scurvy has been classed among putrid diseases. The very nature of its production, the fetor of the breath, cadaverous smell of the ulcers, and bloated appearance of the whole body, seem to have acquired it this appellation. This putrescency was said to exist in the blood, and nothing could be more natural than the conclusion. The Scurvy has constantly followed a peculiar kind of diet; of salted meat, sometimes badly
K preserved;

preserved; of corn, damaged, and mouldy; and with these very often impure water, and no fresh esculent vegetables. This conclusion concerning the state of the body was likewise very much strengthened by the longings and desires of the patient for recent vegetables, which were also found so effectual in curing the disease. It was, therefore, a very simple inference, that the fluids supplied by these kinds of *ingesta* could not fail to partake of their nature.

The word *putrid*, as commonly applied in chemical language, is, certainly, improper: the original meaning is to express any disagreeable smell, but particularly that pungent volatile vapour arising from corrupted, or corrupting, animal or vegetable matter. This offensive effluvium from decaying vegetables is found to be nothing else but inflammable air, or the *hydrogenous gas* of the modern chemists. In the putrefaction of animal bodies, and the cruciform plants, however, the vapour is found

to

to be *ammonia*, or alk. vol. and composed of a substance peculiar to animal matter, and the hydrogen. It is, therefore, a *deficit* in chemical language, and is to be regretted, that those chemists, whose labours have enriched science by so many beautiful discoveries, should not have added to the new nomenclature a term more expressive of that ultimate decomposition of bodies, than what we mean, at present, by the putrefactive fermentation.

To apply this doctrine to the human blood, to account for the proximate cause of Scurvy, is attended with insuperable difficulties. The blood in scorbutics has no particular smell, but is manifestly of a darker colour; it coagulates; it does not grow sooner putrid than other blood in the same temperature of heat. Are these compatible with a præternatural quantity of ammonical salt in the circulating mass? Could any chemical process be so accurately conducted, as to discover whether this salt predominates more in this disease than in

K 2

health?

health? The serum of the blood is certainly more acrid than natural, for the marine salt that has been recovered from the urine, must have mixed with the general mass before it was separated by the kidneys.

At a time when the doctrine now mentioned was in full vogue, not implicitly received, but thought to be confirmed by the experiments of Sir John Pringle; the theory of *fixed air* was extended to its support by Doctor M'Bride. Following, Doctor Hales, and the discoveries of Doctor Black, the present illustrious professor of chemistry in Edinburgh; he considered fixed air as the principle, forming the cement, or bond of union, on which the firmness, soundness, and perfect cohesion of bodies chiefly depends. He, therefore, contended that the putrid tendency of the blood in Scurvy, was owing to the loss of that principle; and by restoring it, we cure the disease.

A method

A method of cure founded on Doctor M'Bride's experiments, and recommended by him, has actually been practised in the navy since that period. The reports of navy surgeons, however, who have made trial of the malt infusion and essence of wort, are very discordant. In a future part of this Work, I shall shew on what erroneous principles both Doctor M'Bride's theory and method of cure were established.

Amidst a multitude of cases coming daily, under observation, Doctor Lind did not fail to inquire after the state of the blood in this disease. From various remarks and experiments, he concluded that the vital fluid had suffered no change, but remained in a healthy state. This, no doubt, prompted him to inquire still farther into the nature of the distemper; and the indigestibleness of the diet inducing a debility of the stomach was assigned as the cause of Scurvy, instead of the putrescency
occasioned

occasioned by the salted meats, so often, and confidently asserted by preceding writers on the subject.

“ I am fully confirmed, says he, in my
“ opinion, that whatever weakens the *consti-*
“ *tution*, and especially the *organs of digestion*,
“ may serve without *any* other cause to intro-
“ duce this disease, in a slighter or higher de-
“ gree, even among such as live on *fresh vegeta-*
“ *bles, greens, or the most wholesome diet, and*
“ *in the purest air.*” * This paragraph taken
from the work of a physician, who had seen
more of the Scurvy than perhaps any other, is
one of the most unaccountable that has ever
crept into the records of medicine; and carries
with it such an air of authoritative confidence,
that it would seem the highest presumption in
me to attempt its refutation, was I not con-
vinced that it conveys notions of the com-

* Lind's Postscript.

plaint very foreign from its real nature. It may, however, be considered as the text of Doctor Milman's opinions, who, following up this idea of the Practical Physician, has founded a theory on debility, and asserts, "that the Scurvy is not a disease of the fluids, but of the solids; that its seat is in the muscular fibre; that its proximate cause consists in the gradual diminution of the vital power, by the remote causes of the disease." *

To these Authors may be added Doctor Blane, late physician to the fleet in the West Indies, who in his Observations on the Diseases of Seamen, says, "It has long appeared to me, that the Scurvy is owing rather to a defect of nourishment, than to a vitiated state of it." †

* Milman's Enquiry into the source from whence the symptoms of Scurvy and Putrid Fevers arise.

† Page 509.

The opinions of these Physicians concerning Scurvy are the same, viz. that the remote causes of the disease, such as the sea diet, act, by not supplying the body with nourishment sufficient for the purposes of a healthy state, and, therefore, the body is reduced to that degree of debility, from whence the symptoms of Scurvy arise.

Before attempting to invalidate their arguments in favour of the *direct debility* induced by the remote causes of Scurvy, let us try the application of their experiments concerning the quality of sea diet, as being salted. Dr. Lind tells us of salt water being sometimes drank in great quantities with impunity, and even scorbutic sailors using it without any bad effect. All this may be very true. Salt taken in this manner, is powerfully diluted with a large proportion of water; to this aqueous fluidity, is owing in a great measure its purgative qualities.

ties. Thus, partly from its bulk, and partly from its acrid nature, it is quickly passed through the intestinal canal; by which means, either so small quantity is taken up by the absorbents, or what may enter the circulation, will be so much diluted with the water taken with it, that though the salt may not be capable of assimilation with the animal fluids, this water will still be the means of its being carried the easier and sooner off by the various excretions. Thus it may be taken with impunity as we daily see; but can we apply the like reasoning to the manner in which it is taken with salt beef or pork. In all accounts of the disease from those who have been conversant with it in our ships of war, till the small beer was done, and the water served in allowance, the Scurvy has been seldom known. After eating salted provisions of every kind, or even salt itself, the thirst which is thereby excited, is a strong effort in nature to relieve the body from the noxious power, which is best done by large draughts of water. Plentiful

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dilution

dilution must, therefore, be of much consequence for the prevention of Scurvy; and there can be no doubt but the salt must also be hurtful, by loading the blood with something foreign to its nature, if it is retained for any length of time in the body.

The experiments of Sir John Pringle and others concerning the antiseptic properties of sea salt, appear to me unworthy to be mentioned, in explaining any process within the body; and I shall reject them altogether.

I believe it is still a question in dispute, whether sea salt undergoes any change in the animal body; but it would not be an easy matter to ascertain it by trial. Some experiments of my own convince me, that salted provisions, such as are generally used in King's ships, beef, for instance, seems to have undergone some very material changes from the salt, before it is taken into the body. This does not depend upon the
beef

beef approaching nearer to a state of putrefaction; for great care is taken that no damaged provisions shall be served to seamen; but there is a chemical attraction between the beef and sea salt. Indeed something of this kind must have been expected to take place, otherwise it could not be preserved: this is, what in common language, is called *taking on the salt*; for if it happens to be too long kept, the elective attraction between them is destroyed, and the meat putrefies. My situation at present, however, does not enable me to prosecute my inquiry in the manner I could wish; but should any chemist undertake the experiment, I beg leave to recommend him to use that kind of beef which has been kept above two years. It is curious to observe the effects of salt on meat preserved for this length of time; in some pieces which I have examined, the whole bone, in particular, seemed to have undergone alterations, and little more was left than the mere earth; from which circumstance, the fleshy part: also, must be con-

siderably changed in their nature. The cylindrical bones are not so soon affected with the salt as those of a softer texture, such as the breast bones and ribs. But these facts render it highly probable, that a double elective attraction takes place here, and, consequently, a change in both substances. If this is the case, it is likely there was some mistake in Doctor Lind's recovering the marine salt pure from the urine of scorbutics. He did not make any comparison between the quantity taken in and that recovered; the fluids, no doubt, might already be loaded with so much salt, as to assimilate no more, and, therefore, it might pass off unchanged by the kidneys. Doctor Cullen's opinion perfectly agrees with that delivered above. He says, "even supposing such salt to suffer no change in the animal body, the effects of it may be considerable." * This must be readily allowed,

* First Lines. Vol. IV.

though

though we should not be able to account for its operation.

But to prove, beyond all doubt, that these provisions are hurtful from being salted, I shall produce Doctor Lind's own words, which plainly show that conclusions he has elsewhere drawn are by no means to be trusted, in this part of the controversy. Nothing, but the sake of truth, could make me thus impeach the accuracy of the learned Author.

“ There are not wanting, says he, instances
“ of the good effect attending the method of
“ putting the ship's company in long voyages
“ upon a very short allowance of salted meats.
“ The following is too much to the purpose to be
“ omitted, as it seems to demonstrate the utility
“ of the measure, by a comparative trial, at dif-
“ ferent times of its effects.

“ In

“ In a former war, the men belonging to the
“ Sheernefs, bound to the East Indies, apprehen-
“ sive of sickness in so long a voyage,
“ petitioned their captain not to oblige them
“ to take up their salt provisions, but rather to
“ permit them to live on the other parts of their
“ allowance. Captain Palliser ordered that they
“ should be served salted meat only once a week,
“ viz. beef one week, and pork the other. The
“ consequence was, that after a passage of five
“ months and a day, the Sheernefs arrived at the
“ Cape of Good Hope, without having so much
“ as one man sick on board. As the use of Sut-
“ ton’s pipes had been then newly introduced
“ to King’s ships; the captain was willing to
“ ascribe part of such an unusual and remark-
“ able healthfulness, in so long a run, to their
“ beneficial effects; but it was soon discovered,
“ by the neglect of the carpenter, the cock of the
“ pipes had been kept all this while shut. This
“ ship remained in India some months, where
“ none

“ none of the men, excepting the boats crews,
“ had the liberty of going on shore; notwith-
“ standing which, the crew continued to enjoy
“ the most perfect state of health. They were,
“ indeed, well supplied with fresh meat.

“ On leaving that country, knowing they were
“ to stop at the Cape of Good Hope; and trusting
“ to a quick passage, and to the abundance of
“ refreshments to be met there, they ate their
“ full allowance of salted meats, during a passage
“ of only ten weeks; and it is to be remarked
“ that the air pipes were now open. The effect
“ of this was, that when they arrived at the
“ Cape, twenty of them were afflicted in the
“ most miserable manner, with scorbutic and
“ other disorders. These, however, were speedily
“ recovered on shore by the land refreshments.
“ Being now thoroughly sensible of the bene-
“ ficial effects of eating in these southern lati-
“ tudes as little salt meat as possible; when at
“ sea,

“ sea, they unanimously agreed in their voyage
“ home from the Cape, to refrain from their
“ too plentiful use of salted flesh. And thus,
“ the Sheerness arrived at Spithead with her
“ full compliment of 160 in perfect health, and
“ with unbroken constitutions; having, in this
“ voyage, of fourteen months and fifteen days,
“ buried but one man, who died in a salivation.” *

This paragraph proves as plain as facts can do, that as a diet approaches more to a vegetable nature, and of that especially to the recent state the Scurvy, will be the more distant. In no part of the Doctor's Work has he been able to invalidate this quotation. It at once also does away whatever he has advanced against the farinaceous part of a seaman's diet; for had it been as hard of digestion as he is willing to make us believe, it could not have prevented the Scurvy as it manifestly did; but the disease must have

* Lind's Essay on the Health of Seamen.

appeared

appeared, equally from its use, as from the salted provisions, if either can produce it, by debilitating the digestive organs, or depriving the body of nourishment.

His experiments upon the blood in Scurvy are sometimes frivolous. These experiments were made at Haslar Hospital, at what stage of the Scurvy we are not informed; nor has he told us how long they had been under medicine and diet on shore. The very sudden recoveries in some cases of this complaint, after the use of fresh vegetables, would make us believe that a day or two must materially alter the state of the human fluids. But if it was true, as has been elsewhere asserted, that the blood in such situation is *præternaturally saline*, patients who had lived but a short time on the hospital broths, which are full of esculent vegetables, if they had no others, must have had the serious part of the circulating mass so changed or diluted, as to pass off rapidly by the various excretories, otherwise

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naturally

naturally disposed to be carried off by these emunctories.

What he has, therefore, said on the taste of the serum, on which Doctor Milman lays so much stress, I am disposed to treat as a mistake. He tells us that the serum of the blood drawn from persons in health, affects the organs both of smell and taste with sensations not easily to be described; whereas the blood taken from persons in the Scurvy, gives the least perceptible sensations by tasting or smelling, of any blood he had examined. The allusion he made use of on this occasion was, certainly, unworthy of his subject. Although it is a proverb as old as the days of Solomon, that there is no taste in the white of an egg, yet we know that it is not matter of fact; for the *albumen ovi*, is not an insipid substance; but yields, upon analysis, all these principles to be obtained by a similar process from animal matter. It might be asked, if the serum of the blood

was

was insipid in Scurvy, how came it to be different from the taste of a healthy state? But the most essential character of the serum is sapidity. It consists of water, in which a large proportion of saline matter is constantly dissolved; it is the vehicle by which nature expels from the circulating mass, those salts which are continually elaborated and evolved by the animal process. It is a well known fact that the urine of scorbutics is uncommonly high coloured, and to the taste more acrid than usual; this, no doubt, may depend very much on the preceding quantity of watery aliment taken into the body. I have mentioned these circumstances, merely to shew, that Doctor Lind's experiments were neither accurate nor decisive; and, therefore, we are not to adhere to his conclusions till better supported. But, as it is not the intention of the present inquiry to contend for the putrefaction of the blood in Scurvy, I shall quit the discussion of its real state for the present.

Let us now see on what grounds they contend for the production of Scurvy, from the exciting causes inducing a state of debility, by a diet hard of digestion, and not sufficiently nourishing. To support this opinion, the other parts of a seaman's fare, consisting principally of unfermented farinacea, are also said to contribute their share, from an indigestible nature. This, certainly, is a part of diet not so easy of solution in the stomach as might be wished, such as biscuits, flour pudding without eggs or milk, and the boiled pease. But the quotation from Doctor Lind concerning the health of the Sheerness crew, when confined to live on this species of sea diet, abundantly proves that the unfermented farinacea, instead of assisting the other causes, will, occasionally, not only retard the appearance of Scurvy, but contribute very much to prevent it. It would be digressing from our main subject, to defend the farinacea as hard of digestion. The lower class of people in most countries, live almost entirely on these substances; they are the healthiest part of mankind,

kind, and among them, complaints of the stomach are very rarely found. Upon the whole, the indigestibleness of this kind of food has arisen more from a predilection to favourite theories, than any reality of their hurtful tendency; particularly from preconceiving that fermentation is the principle agent in digestion. But where are the symptoms after their use, that show a depraved digestion; such as sickness at stomach, want of appetite, and its consequences emaciation of the body from not being duly nourished? "Doctor Lind assures us, that he has
" known messes, as they are called, of seamen,
" who have lived during a voyage of three
" years on the ship's provisions for want of money to purchase better fare; especially greens,
" and yet have preserved their health." * Admitting, even their own ideas of the disease, what are we to learn from this fact? Here is a ship's company living for three years on a diet so

* Vid. Milman, p. 53.

hard of digestion, and supplying the body with so small a share of nourishment, as to produce a disease, at other times, to use their own expression, the very essence of which is weakness; and that, too, often, in the space of a few weeks, by a gradual diminution the of vital power. On these grounds it would be natural to suppose, that the effects would be in proportion to the length of time the causes were acting; but that was not the case, they preserved their health, after living upon it for three years. It is to be regretted Doctor Lind did not more minutely relate the circumstances of the station and services of this ship; the instance of such singular good health, is a solitary fact in the records of naval operations. But I do not think that salted meat itself, as issued in his Majesty's Navy, is that indigestible diet it has been described to be. It is, certainly, cured in the best manner possible; and if it is properly corrected by a due proportion of fresh vegetables, will never be productive of disease.

But

But that debility of the digestive powers, so strongly contended for by Lind and Milman, is not an essential attendant of the disease in question. The curious fact from Van Sweten is altogether trifling, "to shew how any indigestible matter, such as old acrid cheese, irritating and weakening the stomach, may be apt to excite the complaint." Equally trifling it was to say, that a clove of garlick, taken in a morning, would prevent the Scurvy. * Lind, himself, in many parts of his book, mentions the soundness of the digestive organs; in one part, after describing some of its worst symptoms; he says, "most, although not all of them, even in this stage, have a good appetite." Ecthius, one of the oldest writers on Scurvy, has these words, "the appetite is seldom bad; on the contrary, they have generally a good one." John Woodfall, the old navy surgeon, mentioned by Doctor M'Bride, many of whose

* Milman.

observations would do credit to the most refined period of medical reasoning, uses the following strong language in support of what I am now attempting to prove. "The signes of Scurvy, "says he, are many, as namely, a general laziness, and evil disposition of all the faculties "and parts of the bodie, saving the *stomach* and "*appetite*, which is often times greater than ordinary, with them for a long time." The writer of Lord Anson's Voyage, who witnessed so much mortality from this disease, in the celebrated voyage round the world, expresses himself to the same purpose. I shall not, therefore, multiply quotations on the subject, for it cannot be supposed that the stomach would desire food which had already been the cause of disease.

It seems very surprising that none of those authors who have built their theory on debility, should have told us that an emaciated state of body, was one of its symptoms. They, certainly,

tainly, did not find it any how connected with the disease, otherwise it must have been mentioned; and we would readily conclude emaciation of body to be a constant attendant from the following paragraph of Doctor Blane.

“ Unless, says he, the powers of digestion and
“ assimilation are remarkably strong, salt beef
“ and biscuit which have been long kept, do not
“ contain much more nourishment, than saw-
“ dust or the bark of a tree; and the disease in-
“ duced by this diet is Scurvy.” * What a contradiction is this to the *three years health* of Doctor Lind, which followed the same kind of provisions? Salted meat, issued in King’s ships, is often from three to five years old; when prepared, as it is done at present, it may, certainly, be preserved sound for a greater length of time. There are many facts on record to shew that it does not lose so much of that nourishing principle as might be imagined. From my own experience in eating this kind of food, I can affirm,

* Blane, p. 513.

that with occasionally a few plantains or yams, and now and then a little fruit; which it cannot be supposed would add much to the nourishment, I have lived in as perfect health for twelve months as ever I enjoyed in my life; and was, if I right remember, more corpulent than when I left England. The same remark has been confirmed by what I have seen in every person I have sailed with, and I never observed, in any degree, emaciation of the body as a symptom of Scurvy, unless preceding disease inducing a wasting of flesh can be called such. It has been my business lately to make many inquiries for this information among my medical acquaintance in the navy; and not one of them has considered the wasting of the fleshy parts, or an absorption of the fat, as symptoms congenial to Scurvy. On the contrary, in a corpulent state of body, the most hideous features of the disease are expressed; such are the bloated looks and countenance, swelling of the legs, oppression about the breast, depression of
spirits,

spirits, &c. The Scurvy seems to riot in such constitutions with peculiar virulence, and makes quicker strides to a fatal termination. The sudden deaths in this distemper which I have seen, have been in similar cases, where a more favourable prognosis might have been formed. Among the Negroes I found no signs of indigestion or want of nourishment; but, in opposition to these, the diet was highly nutritious, and the inveteracy and aggravation of the symptoms seemed to be in proportion to the corpulency. Here, notwithstanding, many of the predisposing causes had their full force, such as the want of exercise, and confinement in impure air; yet the powers of digestion and assimilation remained perfectly healthy. I will readily allow that obesity is often met with in a state of general debility, and even when the organs of digestion are very considerably weakened: but no man, accustomed to investigate subjects of Pathology, has yet ventured to assert, that obesity can exist, where the

diet is indigestible, and contains no more nourishment than *sawdust* or the *bark of a tree*.

In a ship where I sailed, there was a mess of midshipmen who seldom gave themselves any concern of providing a sea stock, such as tea and sugar, &c. but lived altogether on the ship's fare. The only instance, where I ever knew a midshipman afflicted with Scurvy, was in this mess; he was a young man remarkably corpulent, and the most active for his size I have seen. The symptoms were spongy gums, and oedematous swellings of his legs, which were cured by refreshments in port a few days after the complaint made its appearance, the ship having returned to Spithead.

Although preceding disease seems to predispose the body to Scurvy; yet this is not always the case, and Doctor Lind gives us a strong fact to support it. "Persons very much emaciated
" either with the flux or consumption, are sel-
" dom

“dom or never seized with the Scurvy.” Postscript, p. 508.

But to conclude my argument on this head, that the functions of the stomach are entire, is to be proved from principles established in Pathology. It is well known how long scorbutic patients can indulge the use of acid fruits, without any symptoms of indigestion whatever. There is, perhaps, no disease incident to the human body, where vegetables of this class can be so freely used, without tending, manifestly, to debilitate the tone of the stomach. A small quantity of lemon juice, and even too sour punch, have been known to bring on a fit of the atonic gout; persons subject to dyspepsia are sure to have their complaints aggravated by vegetable acids. It is the same in hysteria and hypochondriasis, and in every other disease where the digestive organs are so immediately concerned. In these cases a degree of fermentation, the certain sign of a weak stomach, and an imperfect digestion

digestion always takes place; hence, cardialgia, gastrodynia, flatulency, and ruētations, &c. follow. Whereas we find no such effects to be the consequence of their use in Scurvy; though the quantity of limes and lemons taken sometimes has been almost incredible.

Upon the whole then, I must observe, that a sea diet is not productive of Scurvy from being hard of digestion, or not affording sufficient nourishment; and that in this disease, there are, really, no symptoms of a weak stomach present.

But, let us inquire a little farther into the supposed effects of this depraved digestion and nourishment, which are said to produce that gradual diminution of the vital power, from whence the symptoms of Scurvy arise.

It ought to be premised here, that I have no intention of offering any arguments against the debility

debility present in Scurvy; on the contrary, the relaxed tone, and diminished cohesion of the muscular fibre shall be admitted in their fullest extent. But I am well aware that their is a state of the body to be corrected, independant of that debility in the primary moving powers; and which indications of cure, cannot be accomplished by those means that are found the most effectual to restore the tone and tension of muscular fibres.

The causes which predispose the human body to Scurvy, are, I readily allow, of a debilitated nature; viz. excessive cold, fatigue, low spirits, &c. and their action on the system are elegantly detailed by Doctor Milman. But all that can be said of their effects is, that they only accelerate the approach of Scurvy, and render the body more susceptible of those causes which excite it. The whole of them combined are unequal to produce the complaint, a something

thing is still wanting; and it is, perhaps, of little importance, whether we consider that as a diet of salted meat, or a deficiency of recent vegetable matter. We shall be afterwards inclined to lean to the latter.

But so much has been said by different authors concerning these predisposing causes, that we would be apt to believe the Scurvy is never known without their concurring to produce it. Cold, whether from season or climate, we are assured, is not necessary to excite the disease; it is found equally virulent in its symptoms between the tropics as in Greenland. We meet with it in ships during the mildest dry weather; humidity is not, therefore, absolutely required. I can aver that I have witnessed its appearance in numerous cases where no predisposition of the body could be suspected, and where foremast men of all descriptions were sufferers. I have seen what is called a *hardy seaman*, who had
treated

treated the raw scorbutic landman under his affliction with the most sovereign contempt, forced, a few days afterwards, to confess the attack of the Scurvy, when he found it was neither in the power of resolution or exercise to overcome the complaint. Lord Rodney's fleet, in the passage from Jamaica to New York, in 1782, affords a striking proof that the Scurvy will appear in ships when climate and weather are both favourable to health. Doctor Blane says, the whole fleet was more or less afflicted with it, though they had only been seven weeks and three days at sea. If there was any predisposition in these cases, it is not mentioned by the learned author; he only says, that they had few refreshments in port before they sailed, so that the sea diet had been the sole cause. * It is, therefore, of great importance to guard against such conclusions; partial observations might have a dangerous tendency in regard to

* Blane, p. 146.

the prevention, as making us unmindful of administering those salutary correctors of a sea diet, which we may otherwise employ.

The debility of Scurvy is of so singular a nature, that nothing seems analogous to it: certain it is, that no disease is related to it, by any concurrence of symptoms or method of cure. Those medicines which invigorate the system in other cases of debility, have little or no effect here. Wine, the sovereign remedy of typhous fevers, gives a momentary stimulus, but no permanent relief. It does not retard the disease; and it is not, even when the mind is sinking under despondency, desired by the scorbutic patient. But wine is not only unable to cure the disease, but is found of very little service in the prevention. In three instances where we have seen it general in a ship's company, every man had his pint of wine a day, which is the allowance when the beer is done; there are few surgeons that
have

have had any share of experience in the treatment of this distemper, but must have made the same remark. The celebrated Peruvian Bark, given to the utmost extent, has never been known to check the progress, or cure the Scurvy; its well known powers in recovering the weakened tone of the stomach promised much, had the digestive organs been so much deranged as has been asserted. As a general tonic, we might have also hoped to find it cure general debility; but there is not now a navy surgeon that ever thinks of employing it. The scorbutic ulcer, after the use of bark for a length of time, and in great quantities, has not put on a more healthy appearance; the thin discharge is equally abundant, and the cloat of blood on the surface is regenerated as before. But, the most powerful stimulant applications do not alter the condition of these sores; whereas, in the space of twenty-four hours, after the use of limes or lemons, they have put on a florid and healthy appearance; but it is well known in practice

how rapidly some large scorbutic ulcers will heal when the patient comes to be well supplied with the acid fruits and fresh vegetables. This defect of the wine and bark just mentioned, may be extended to the whole class of tonic and stimulant medicines, such as preparations of steel, &c. In the cure of this disease on board of a ship, we also find that a diet of fresh meat is not absolutely necessary; but that it may be effectually cured while in the same situation, by allowing fresh vegetables, and particularly the acid fruits to the seamen.

About the end of May, 1780, the *Berwick*, of 74 guns, sailed for the West Indies, with the squadron under the command of the brave and unfortunate Commodore Walsingham, who perished in the *Thunderer*, in the memorable hurricane off Bermuda, the October following. On the third week from our leaving England, some of our men complained of a stiffness of the knee, swelled gums, and other symptoms of Scurvy.

Scurvy. The beer had been now done a week, and the water was served to the ship's company, a certain allowance per man a day. When we arrived at Jamaica, though we got some refreshments to windward, thirty-five of the crew were tainted with Scurvy, some of them in its worst stages. The passage from the Lizard was not more than eight weeks, and the weather so remarkably fine, that scarce a shower of rain fell while we were at sea. The hospital at Port Royal was at this time full, and could receive no more sick; the only alternative was, therefore, to cure them on board. This was performed by the limes, oranges, &c. the greater part of which were got in exchange for their salted provisions; which exchange I superintended, in order to prevent them from taking any new rum from the black women who occasionally brought the fruits to the ship. No change was made in the other parts of their diet; for during the four weeks we lay at Port Royal, only one meal of fresh beef was served to the ship's company.

The

The happy consequence of this treatment was, that in ten days they all returned to their duty upon deck.

In the October before this ship went abroad, when the grand fleet put into Torbay, nine of the Berwick's people were tainted with Scurvy; many others at the same time in different ships of the fleet were affected in a similar manner. This had been a plentiful season in the cyder countries, and the apples were so cheap, that the seamen procured them in great abundance for a trifle. Our people ate such quantities, that bowel complaints became very frequent among them; so much so, that orders were given for no more fruit to be admitted on board. The scorbutics, however, in the mean time, had shared so plentifully of the apples, that in a few days they were perfectly recovered.

During the Baltic armament, sometime in the month of August, Daniel Carr, aged about thirty-eight,

eight, a stout man, on board the Royal William, then lying in Portsmouth Harbour, was attacked with the Scurvy. He had conceived a great desire of going on shore to the hospital, and concealed his complaints till they got to an inveterate degree. At this time, from the difficulty the contractors found in procuring bullocks sufficient for the consumption of so large a fleet as then lay at Spithead, fresh beef was served to the seamen only twice a week. This man expressed to me very emphatically his desire for fresh vegetables. The pains on different parts of his body tormented him more, than most scorbutics I have seen. As soon as he grew warm in bed they were unsupportable, particularly in his shin bones, and seemed in every respect to resemble the syphilitic pains of these bones. Opiates had the effect of putting him asleep; but the pains were aggravated by them, and felt more severe when he awaked. His knee was contracted, the flexor tendons hard and rigid; large blotches, livid

livid and black covered the under part of the thigh; effusions of blood also appeared in a livid circle round the eye. Instead, however, of sending him to the hospital, he was kept on board. The only remedy made use of, was six or eight pears and apples twice a day, with two glasses of wine after dinner: both the fruit and wine were dispersed to him from my own hands. By these means, on the ninth day from the time he complained, every symptom of Scurvy disappeared, though he seemed to be very sensibly disappointed by not being sent on shore to be cured. Several ships lying at Spithead had sent men to Haslar hospital, all of whom had contracted the complaint in port, from the circumstance of supplying the fleet with so small a proportion of fresh beef. These are a few of the many instances where Scurvy has been cured, without any material change of diet; where no restorative food, or stimulating medicines were administered, and though in a ship the cure was not less sudden and
complete

complete than when the patient had conveniences of quarters on land.

We have already mentioned the debilitating effects of the acid fruits in the stomach; but they extend to the whole alimentary canal, and the system in general. Their constant attendant is a very lax or purging state of the bowels; the body becomes evidently weaker, and loses its plumpness during their use; this is sometimes carried to a great degree of emaciation. Among the Negroes it was remarkable; yet the cure of Scurvy went on progressively; its more particular symptoms soon disappeared; and depriving the constitution in this manner of its nourishment, does not seem to retard or lessen the antiscorbutic effect of the fruit. These are facts too stubborn to be overcome, and they confirm, beyond the possibility of doubt, that there is *a state of the body to be corrected, beside the debility.*

The learned physician to the fleet, himself, affords us another striking proof in support of what I have just said. “When the fleet arrived
“at Barbadoes, in May, 1781, part of the soldiers who had served as marines, were affected
“with the Scurvy, and being sent to the army
“hospital, where, at that time, no fresh animal
“food was allowed; they recovered *much faster*,
“being confined to vegetable articles, than the
“seamen who were fed upon *fresh animal food*,
“without any fresh vegetables.” *

This paragraph, certainly, speaks as plain as language can do, and is perfectly applicable to our purpose. It says, that Scurvy was not cured so fast by a diet of animal food, the most nourishing of all diets; as it was by one altogether vegetable, one, that is well known to weaken the body, and substract nourishment from it. The conclusion that follows, is, therefore, of course,

* Blanc, p. 301.

that

that the whole doctrine of the remote causes inducing Scurvy *solely*, by a gradual diminution of the vital power, must fall to the ground.

Had the author of the above quotation in his meritorious attendance of the British fleet last war, carried his opinions into practice, that the Scurvy was rather owing to *deficient* nourishment than any thing else; a diet of animal food, as being the most strengthening, was, certainly, more likely to fulfil his indications of cure, than the debilitating citric acid. It was that sort of fare that was best suited to distend the vessels, with healthy nutritious juices, to give the blood a denser consistence, to repair the waste in the system, and to excite the primary moving powers to strong and vigorous contractions.

The following paragraph of Dr. Milman's, demands particular attention; speaking of the symptoms of Scurvy, he says, "if the circumstances of the remote causes varied in the

“lightest degree, the diminution of the vital
“power would be modified by that difference in
“them, and the effects and symptoms resulting
“from it, would not be those of the Scurvy,
“but of another disease, though related to it in
“many particulars.” This he illustrates by the
following remark. “In the neighbourhood of
“the Alps, which are covered with perpetual
“snow, where cold concurred with a scarcity of
“provisions, a Scurvy was produced; but during
“a similar famine in the mild climate of Naples,
“petechial fevers, and dry gangrenes were the
“chief diseases.” * But there are two ways of
applying this fact, and let us first try it by the
following method. Let the standard of health
be fixed at a given number, at 40 for instance.
All debilitating powers applied to the body, will
have their degree of action in this scale, and
each will produce its disease. One power, as
famine in the mild climate of Naples, will re-

* Page 76.

duce the body to 30, which we shall call petechial fever; but the same debilitating power joined to another, as famine with cold, in the neighbourhood of the Alps, will bring it to 28, which may be called Scurvy. If this explanation can be admitted, it is, no doubt, accounting for the operation of noxious powers in the human body in a very simple manner indeed; but we can admit no such application and reasoning on the fact; for we find no stimulating and restorative properties in the citric acid, equal to excite the body so suddenly from a state of debility that is 12 degrees below the standard of health. We would, therefore, account for the fact in a very different manner. In the neighbourhood of the Alps, which is covered with perpetual snow, the rigorous season had destroyed all vegetation, and among the rest the oleraceous herbs; so that the Scurvy was the consequence of the famine: but in the lower situation, and warmer climate of Naples, putrid fevers were the consequence: the weak nourishment had predisposed the body to
receive

receive the contagion of Typhus; but the produce of fresh vegetation had effectually secured it from Scurvy, which would have also saved the inhabitants of the Alps had they possessed it. We are acquainted with no modification of the remote causes that influences the operation of a sea diet. From the most northern latitude of the arctic circle that has been navigated, to the equator, its effects have been constant and uniform in producing one disease. We, ourselves, have witnessed the appearance of Scurvy, in the same ship's company, from the northward of Shetland to within the Tropics, and in many of the intervening latitudes, and can allow no other modification of the remote causes, but what arises from the deficiency of fresh vegetable matter. The effects of sea diet are not even altered by the concurring action of humidity, fatigue, preceding illness, sedative passions, &c. though these will occasionally accelerate the approach of scorbutic symptoms.

Doctor

Doctor Lind must have found the approved method of cure, to accord very little with his notions concerning the production of the disease, and the proximate cause which he assigned; he says little about it to the purpose. Doctor Milman, however, who is always ready to extend Lind's ideas of the subject, is, evidently, biased by his theory, and is extremely inconsistent in reconciling the practice with the reasoning he has adopted. I flatly deny that the lemon juice is rendered most efficacious by diluting it with warm water or gruel; its best form is to let the patient suck it from the fruit. The effects of the citric acid we are informed were sudorific and diuretic. Is it not as much a solecism in language to speak of an evacuant restorative, as to speak of an evacuant antiseptic? * What have sudorifics to do with supplying nourishment, in a disease that has been caused by a diet affording none? As the cure proceeds, the skin no doubt, becomes soft and relaxed. But if lemon

* Milman.

juice could be supposed to communicate a stimulus to the surface of the body, and act as a sudorific, is it a rational method, to cure a disease, in which the body is exhausted by indigestible diet? Certainly, not. The diuretic effect of the juice is also to be ascribed to the watery principle with which it abounds; for there is seldom any præternatural accumulation of water in the body: it could not, therefore, be owing to any increased tone and contractility, imparted by it to the absorbents, the renal artery, or the general circulating system of vessels. The Peruvian Bark is coldly said, to "be spoken of by some authors as being "of remarkable use in some cases of Scurvy." * We have already given our opinion of it; Doctor Lind's was much the same; but could the learned Doctor Milman, pass so quickly over the medicine which has been so deservedly extolled for its tonic powers without asking himself, why does not every writer on Scurvy bear testimony

* Milman, p. 192.

of its efficacy? Affuredly it may be answered, because it does no good there; something more than tone is to be first restored to the body.

With respect to what Doctor Lind says of the people whom he debarred of eating green vegetables, fruits or roots; he only draws a negative conclusion, "*they in general grew better.*" He did not say any of them were cured. When he endeavoured to discover the comparative effects of fruits and vegetables, he did not observe any superior antiscorbutic virtue in the esculent articles he mentions, above the hospital broths with beef and greens. This only shews that the broth, with the vegetables usually boiled in it, was equal to cresses, &c. but he does not deny the superior efficacy of the fruit which possesses the citric acid. He agrees to this elsewhere, and confirms by his testimony what every practitioner has done, since the lemon was first taken to advantage, near two hundred years ago.

I am willing to allow as much credit as ought to be given to those cases of Scurvy, that were cured or relieved by whatever raised the spirits of the patient, such as good news, &c. but I must confess, some of these relations appear to me much exaggerated. What I particularly allude to, is Vander Mye's narration of the siege of Breda, and that of our own countryman, Mr. Ives, in the Mediterranean fleet. How a disease, attended by a train of such singular symptoms, acquired in the manner that Scurvy usually is, should, all at once, be cured by any exciting passion of the mind, seems, indeed, wonderful. But, admitting, for a moment, that the diet which induced the disease at Breda, and in the Mediterranean fleet, acted solely by exhausting the body, and weakening the nervous energy; would it not be multiplying incredibilities to assert, that belief in a dose of a wonder-working balsam, or the joy of conquering an enemy, could make up, in so short a time, for a long deficiency of nourishing food? It would look
like

like reviving an age of miracles, to say, that the bloated face assumed its ruddy hue, the contracted hams became straight, and their hardened muscles recovered their mobility in proportion to the glad tidings. Doctor Lind, in his Note, after relating the cases at Breda, did well to ask, whether or not the speedy recovery of the patients might not be owing to the decoction of green herbs beginning to sprout up, at the time the Prince of Orange sent the three phials to their relief; but, on the other hand, he is unwilling to allow any effect to five servings of *broth* and *greens* to the crew of the Dragon, in the Bay of Hieres, before the engagement.

I have no doubt but the buoying up the hopes of the patient, so constantly depressed in Scurvy, may go a great way in assisting the means of relief; but if we expect more it will introduce a careless practice, and may do harm.

Our arguments, therefore, against the doctrine of debility, enable us to draw the following general conclusions:—

I. That a seaman's diet, as consisting of salted meats, &c. does not produce Scurvy, by weakening the digestive organs from its indigestible nature; and thereby abstracting nourishment from the body.

II. That the debility which accompanies Scurvy cannot be cured by those means, which are found, in other cases, to be the most effectual in restoring the tone, tension, and contractility of the weakened muscular fibre. And

Lastly, That the proximate cause of Scurvy, is still to be sought for, from some peculiar state of the blood.

Notwithstanding the many difficulties which oppose every theory of Scurvy hitherto offered,

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I am very unwilling to sit down contented with our present knowledge of the disease. What we now know, may, to some appear sufficient for the purposes of curing it; but I must confess, I am not so fully satisfied. The farther our inquiries and observations go, we shall be the more certain in prescribing means of prevention: but by persevering industry in collecting facts, we may probably gain from the assistance of medicine, what is now only to be found from recent vegetable matter; and fresh vegetables, it is well known, are difficult to be procured, where the disease is most fatal, viz. in ships at sea.

The only change in the state of the blood that is properly authenticated by writers on Scurvy, appears to me to be in the colour. At a time when I had no intention of being an author on the subject, the dark, if not black colour of the blood always struck me. In page 36 of the first edition of my Observations is to be found the following Note:—"The blood that flowed
" from

“from these hemorrhagies was always of a *darker colour than natural.*” I have made it my business to ask some of the most intelligent navy surgeons, if they had ever observed the colour of the blood changed. The remark I find is general; Doctor Lind, in his Postscript, where he describes the blood as he took it from different patients, mentions only one, where it was of a ruddy colour; this patient he said was feverish likewise. But he was particularly attentive only to the coagulation; and, probably, these patients had all taken fresh vegetables before he bled them. From what we have seen of a scorbutic ulcer, in twelve hours after the use of lemons, I am apt to believe that this ruddy colour is very quickly restored to the blood. But Lind, in narrating the symptoms, allows the change of colour fully. “When we examine, says he, narrowly, the lips or corners of the eye, where the blood vessels are most exposed, they appear of a greenish tinge.” Now this is remarked among the first symptoms of the first stage of Scurvy.

Scurvy. He adds, a little below, "the colour of
" the face becomes afterwards more darkish or
" livid, and the gums have an unusual livid ap-
" pearance." He admits the fact in its most
extensive meaning in other stages of the disease.
The change is, certainly, expressed in the most
lively manner, on the cheeks and lips, where the
ruby colour disappears, not to mention the black
spots over the body, the black cloat on the sur-
face of the ulcers, and the pieces which occa-
sionally fall from the gums. Other authors,
are strenuous in giving their testimony to the
same change of colour: Doctor Grainger, in his
letter to Lind, says, it is of a *livid colour*. The
following account is given in Doctor Lind's
Book from Lord Anson's Surgeons. "In the
" beginning of the disease, the blood, as it flowed
" out of the orifice of the wound, might be seen
" to run in different shades of light and dark
" streaks. When the disease increased, it ran
" thin, and seemingly very black; and after
" standing some time in the porringer, turned
" thick,

“ thick, of a dark muddy colour. In the third
“ degree of the disease it came out as black as
“ ink. In dissected bodies, the blood in the
“ veins was so entirely broken, that by cutting
“ any considerable branch, you might empty the
“ part to which it belonged, of its black and yel-
“ low liquor; and when found extravasated it
“ was all of the same kind. Lastly, hemorrha-
“ gies were frequent, at the latter end of the
“ calamity, the fluid had the same appearance as
“ to colour and consistence, whether it was dis-
“ charged from the mouth, nose, stomach, intes-
“ tine, or any other part.”

Roupe, *De morbis Navigantium*, made the following remarks on the colour of the blood.
“ In the first stage the blood as it flowed from
“ the veins, was thick and black; and after
“ standing, separated into a yellow water or se-
“ rum, and a grumous mass. In the second
“ stage, the blood was pretty much in the same
“ condition, with this difference, that it flowed
“ with

“ with greater difficulty from the veins, and was
“ of a darker colour. Some drops of it received
“ upon clean linen did immediately coagulate.
“ This blood, after standing some hours, deposti-
“ ted a thick muddy sediment, and the serum
“ became reddish. In the last stage, the blood
“ was quite black, and became for the most part,
“ soon covered over with a thin greenish pellicle,
“ which was easily removed; the grumous mass
“ was not so strongly coagulated as in the former
“ stages. There was, however, always a distinct
“ separation of the parts of the blood.” Rouppe,
Sect. 2. Cap. 2.

It ought to be remembered that this author mentions the coagulation of the blood: therefore, in confirming the preceding quotations, he cannot be accused of favouring the putridity of the vital fluid. We have thus satisfied the most scrupulous inquirer, from the concurring testimony of the most respectable authors, as well as our own observations that the florid healthy co-

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lour of the blood, is changed in Scurvy, to livid, darkish, and even a black shade.

Various have been the opinions of philosophers concerning that principle which gives the red colour to the vital fluid. It is a general remark among phisiologists, that the venous blood is always of a darker colour than that of the arteries. The florid colour seems, therefore, to be gradually changed and expended in the course of circulation from the heart to the extreme vessels on the surface of the body. It is also found again restored in the passage of the blood through the lungs, by the action of something which it receives from the atmosphere during respiration.

Much light has lately been thrown on this subject from the experiments of Dr. Edmund Goodwyn, first published in his Inaugural Dissertation at Edinburgh, and since that time in English, under the title of *The Connexion of Life with Respiration.*

Respiration. From the accuracy and address with which these experiments were conducted by this ingenious young physician, much, it is well known, can be trusted to them. Doctor Goodwyn's trials fully confirmed the opinion, that the blood received its more florid colour during the action of respiration; and this he ascribed to the chemical effect of the pure part of the atmospheric air, commonly called dephlogisticated air.

But some collateral experiments in Doctor Goodwyn's Work, justify the conclusion, that vital air, in other situations will change the dark complexion of the blood to a florid colour. He says, "but it has been often asserted, that "that black blood fresh drawn, and exposed to "dephlogisticated air, becomes florid.

"To ascertain the truth of this assertion, I inclosed a quantity of dephlogisticated air, in a

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"glass

“ glass receiver inverted in quicksilver, and introduced into it four ounces of blood fresh drawn from the jugular vein of a sheep: the blood became instantly very florid, and the quicksilver seemed to ascend a little in the receiver. To ascertain this latter circumstance I repeated the experiment three or four times; the change of colour was always very sudden, and after several minutes, the quicksilver ascended two or three lines. It is evident, then, that dephlogisticated air changes the colour of black blood, and a small portion of the air disappears in the process; but as the changes in these experiments are similar to those in respiration, it might be inferred, that dephlogisticated air produces the florid colour in both examples.” Page 62.

These experiments render it highly probable that the black colour of the blood in Scurvy is owing to the abstraction of this principle by the
remote

remote causes; and we shall strengthen the opinion still more, by shewing that vital air is a component principle of fresh vegetables, but particularly of these that are found most effectual for the cure of this disease.

It is, I believe, a fact now fully established, that Scurvy is never found, where there is a due supply of fresh esculent vegetables. The cases on record to the contrary are few; and there is not an instance where the prevention and cure could not be fully accomplished by the acid fruits; at least as far as human knowledge extends in preventing and curing diseases. The investigation of this principle, we hope, therefore, will throw very considerable light on the subject of the proximate cause of Scurvy.*

Doctor

* The principal objections against this opinion, are the Scurvies which happened in Hampshire and Winchester Prison in 1759. But to do away the first, Doctor Lind, himself, adds, "The account here given, does not detract from the antiscorbutic qualities of green
" vegetables,

Doctor Lind seeking for this principle in vegetables, plainly discovers how much his ideas were fettered by his favourite doctrine of deficient nourishment, and the debility of the digestive organs, which in this inquiry has betrayed him into many errors. He says, “recent vegetables, fresh plants and fruits, are of a more tender texture than animals; and their parts being more easily separable, they yield more readily to the dividing powers of our organs.” Speaking of the antiscorbutic herbs, he adds, “these herbs not only strengthen the tone of the stomach, and invigorate the organs of digestion, but restore the suppressed excretions, promote a copious flow of urine, and increase every secretion of the body, which is

“vegetables, as it is probable, that without their assistance, few of those patients would have recovered.”—Page 274. And to remove the objection at Winchester, among the French prisoners; Mr. Lloyd, the surgeon, tells us, that they were allowed greens all the preceding summer in place of peas, till within *two months* of the time that these scorbutic complaints became so general. Lind, p. 277.

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“the most *essential* quality of an antiscorbutic
“composition. That they strengthen the powers
“of digestion, appears not only from the quick
“increase of appetite occasioned by them, but
“from the breakings of wind, which follow
“each dose.” * What I have before said on
the debilitating effects of vegetables upon the
stomach might seem to anticipate any remark
here. How the essential quality of an antiscor-
butic composition, is to be determined by its
promoting and increasing the secretions, I am at
a loss to understand, unless something noxious
is to be eliminated from the body. To fill the
vessels for the purpose of emptying them is an
absurdity in meaning and terms. But the doc-
trine is utterly inadmissible, that plants and
fruits are more tender, and easier to be divided
by the organs of digestion than animals. The
venerable author of the above quotation in his
practice, must have often dissuaded his dyspep-

* Lind. Part II.

tic patients from indulging the use of vegetable diet; at least not without certain restrictions. I knew a lady so miserably afflicted with these painful affections of the stomach, that she was often under the necessity of giving up every kind of vegetable food; even the best fermented bread became uneasy; so much so, that sometimes her diet has been for weeks solely of an animal nature. I saw her once under these circumstances, when she had many symptoms of the Scurvy, such as spongy gums, livid spots on her arms and legs, &c. At this time she lost one or two of her teeth; but the indigestion wore off, and she ate pot herbs for some time without any inconvenience. Nothing is more generally agreed among physicians, than, that medicines, stimulant and tonic, with a corresponding diet, such as a large proportion of animal food, with the stronger wines, Madeira and Sherry, are the best restorers of depraved digestion. We are, therefore, to reject the man-

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ner in which Doctor Lind explains the antiscorbutic quality of recent vegetables.

The superior efficacy of the acid fruit in the cure of Scurvy is so well ascertained, that it might seem superfluous to add any fresh remark to what is so fully admitted. These articles are certainly more beneficial as they approach to the nature of the citric acid, which, is that abounding in the lime, lemon, &c. Our summer fruit in this country, such as the apple and gooseberry, lose their acidity as they come to maturity; so that in their immature state they possess most of that principle valued in the cure of Scurvy. In all cases of Scurvy which I have attended, I have remarked, the longings and desires of the patient for acids; which, also, have been mentioned by some of the earliest writers on the disease, and more or less by others since that time. It is one of the strongest instincts in nature that we are acquainted with.

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Having repeatedly observed the scorbutic slaves throw away the ripe guavas, while they devoured the green ones with much earnestness, I resolved to try if there were any difference to be remarked in their effects. For this purpose I selected nine blacks, affected in nearly a similar degree with Scurvy. To three of these, I gave limes, to three, green guavas, and to three, ripe guavas. They were kept under the half deck, and served by myself twice or thrice a day. They lived in this manner for a week, which was about the time we left the coast of Africa; and it is to be remarked, that the three Negroes restricted to the ripe guavas continued in much the same situation, while the others were almost well.

After the long cruize of Sir Charles Hardy's fleet, in the summer of 1779, in the channel, a few of the raw sailors in the Berwick were tainted with Scurvy. It was not, at that time, thought necessary to send them to Haslar Hospital; but they were permitted to go on shore

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to the Isle of Wight, for the benefit of air, exercise, and what fruit they could pick in the woods, under the care of an old seaman, called Robert Wood, who pretended to great knowledge of antiscorbutic herbs: it was, however, observed, what he pointed out for their use, were the berries and herbs possessing the acid quality, which he distinguished by tasting.*

In order, therefore, to discuss this subject as briefly as possible; we shall endeavour to find out the nature of the citric acid, as abounding in the lemon, for an example of the whole.

Every substance in nature which possesses that quality which is distinguished by the term *acid*, is found to be composed of the acidifying principle, and a base peculiar to itself. This constitutes the difference of acids; each has its own radical; but what communi-

* In relating these facts, I beg leave to be understood, as having no intention to support the doctrine of a *Vis medicatrix Naturæ*.

cates acidity to the whole is vital air, or the dephlogisticated air of Doctor Priestly. This fact is now so fully explained from the experiments of modern chemists, that no room is left to suspect its certainty; it would therefore, only lead to a fruitless prolixity to repeat the authorities which support it.

Since, then, it is agreed that vital air, or what is more properly called *oxy gene*, is a component principle of the acid fruits, we have reason to conclude, that this is the quality which they restore to the human body in Scurvy. We have proved that the blood in this disease is altered in colour from its natural state; that instead of a florid, it is changed to livid and black; and we have found from Doctor Goodwyn's experiments, that vital air is the principle in nature which restores the florid colour to the vital fluid; from which the conclusion is obvious, that the *effect* of the citric acid is owing to this quality. The proximate cause of Scurvy is, therefore, nothing else but a something abstracted

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ted from the body, by the remote causes; and from what has been just delivered, we pronounce that to be vital air.

We are of opinion that the citric acid is decomposed by the organs of digestion and assimilation, after which the oxygenous principle is by chemical attraction blended with the circulating mass; but what other changes it may undergo there, besides giving the blood a florid colour, we are not bound to explain.

The first change which I have remarked in scorbutic cases, after the use of lemon juice, is the sudden alteration of the ulcers. The livid complexion of the sore itself, with the black clot of blood on their surface, disappears, oftentimes in less than twenty-four hours. The ulcer becomes florid, the clot of blood is not regenerated, and a smaller quantity of pus than is usually found in other sores of equal size, is the consequence. The patient in the inveterate stage of the disease seems to
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gather strength even from the sight of the fruit: the spirits are exhilarated, by the taste itself, and the juice is swallowed, with emotions of the most voluptuous luxury. The gums are gradually hardened, and the teeth fixed in their sockets. The dull eye and bloated looks in a few days, put on the clear healthy complexion, which also extends to the whole surface of the body. The absorption of the effused blood in different parts goes on rapidly, and by marking the spots, you may calculate the progress of the absorption, and cure of the disease. This absorption bespeaks a degree of stimulus communicated to the lymphatic system as well as the sanguiferous, as soon as the blood has received a sufficient quantity of the vivifying principle. From the effects of the juice upon the bile, the colour of the stools is changed, and a lax state of the bowels is the consequence. But it is to be observed, that this laxity of the intestines may be moderated by giving the fruit in smaller quantities: a speedy cure, however, demands that

that they should be given *ad libitum*, and the greater number of lemons taken in a day, the recovery will be more rapid in proportion. The emaciated state of body formerly mentioned, does not seem to be altogether owing to the purging, carrying the nourishment away; but it is probable that a proportion of undecomposed acid, so affects the assimilation of the aliment, that it is taken unprepared into the blood vessels, peculiarly acts upon the fat, reduces it to a saponaceous state, and disposes it to run off by the excretions, thereby inducing a wasting of the fleshy parts, and adipose substance.

But it will, no doubt, be asked in opposition to the proximate cause we are wishing to establish, and the principle which we suppose the citric acid to communicate to the blood; how comes it that every acid is not equally effectual in the cure of Scurvy, since they all possess this common principle, and many of them in a
much

much greater degree than the lemon juice? This would appear, at first sight, rather inexplicable; but we hope to do away the objection completely.

The oxogenous principle, like that of all bodies, which have been the subjects of chemical experiment, is found to possess different degrees of attraction for the substances with which it comes in composition, and for the radicals of the various acids to which it communicates an acid quality. In the celebrated table exhibiting the chemical nomenclature; proposed by Messrs. De Morveau, Lavoisier, Berthollet, and De Fourcroy, in May 1787, are to be found, these bodies, of which oxogene is a compound, arranged according to the degrees of elective attraction, or affinity as it is called by the French chemists. At the top of the column is water, next follows nitric acid, carbonic acid, sulphuric acid, &c. and not till after the tartarous acid, come the
oxalic,

oxalic, gallic, citric, and malic acids: hence these acids by being more easily decomposed, or their radicals and the oxygene, being combined in weaker degrees of attraction, they are acted upon by the powers of digestion and assimilation of the human body; by which means they become subjected to the animal process, and form new combinations with our fluids. The oxalic acid which is found in sugar, &c. has often cured the Scurvy, but this effect has not been known from any plant that affords it, but the sorrel. In sugar it is combined with so much vegetable mucilage as not to be decomposed. The malic acid, found most pure in the unripe apple, and combined with the oxalic and citric acids in most kinds of fruit, is a valuable antiscorbutic, and if used while the apple is in its immature state is equal to the lemon. The green gooseberry possesses these acids in great perfection.

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But, further, another objection may be still urged. Since these acids which cure the Scurvy, viz. the malic, citric, and oxalic, can by combining more oxygene with them, be converted into one another, in the manner they are set down in the above line; and then, by adding still more oxygene, be reduced to the pure acetic acid or radical vinegar; how does it happen that this last substance has never cured the disease, though given sometimes in very large quantities? We can only obviate this objection, by assuming it as a matter of fact, that by encreasing the proportion of oxygene or bringing the radical to a more perfect saturation, we also increase their reciprocal attraction; by which means they undergo no decomposition in the body, but only act upon the fat, and dispose it to run off by the excretions. But this is still more confirmed by the nitric and sulphuric acids; where the acidity approaches to the highest degree, and

and in whatever manner they are exhibited, they pass through the body pure, and unaltered, as when taken into the stomach.

Many facts and experiments are, no doubt, wanting to give this theory stability; and it is offered to the learned with extreme diffidence. A substance that exerts such wonderful powers on the face of creation, has certainly its share in the internal œconomy of nature. The history of *pure, vital air*, comprehends the respiration of animals, the heat of the blood, and probably the hitherto unexplored subject of secretion. In vegetation it is equally useful: it is a component principle of water; it alone supports combustion; by it metals are calcined; it is the oxygenous principle in nature; in short its influence is unbounded, and the modifications of its agency are beyond calculation.

The *Ratio Symptomatum* in Scurvy is certainly a difficult subject to enter upon. In what manner a diseased state of the blood communicates its influence to the moving powers of the body we are at a loss to explain. The Scurvy, however, is not the only disease of this kind; and the contracted hams, pains of the shin bones, &c. are no more inexplicable than the phenomena of fever, which follow the absorption of various matter. It may, perhaps, favour something of the Stahlian system of an *administering soul*, to trace the ardent longings and desires of scorbutic patients for recent vegetables: no fact, however relating to the disease, has been more generally remarked, whatever we are to ascribe to a *Vis medicatrix Naturæ*. No symptom appears more singular than the clot of blood covering the ulcer in the inveterate stage of the distemper. Certainly no *solution of continuity*
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in any other disease of debility presents a similar appearance. No state or condition of the moving fibre, can be adduced from analogy to account for this wonderful change in the effused blood. It cannot be owing to the external air, for cover the fore in whatever manner you please, the mass will be shortly regenerated. How comes it also, that the serous parts, by any stimuli applied to the fore, shew not the least disposition to be converted into pus as in other cases? The pains of the shin bones, though resembling syphilitic pains in the same bones, by becoming worse in bed, yet they differ from them, in never ending in nodes, tophs, &c. And indeed the Scurvy is attended by a train of symptoms peculiar to itself, and which the genius of the distemper has rendered extremely difficult to explain.

On the whole, if we have not established a new proximate cause, we have proved to
demonstration

demonstration that the late theories of Scurvy, however speciously defended, are illusive, as tending to mislead the practitioner; and therefore another mode of investigation was wanting that might arrange, and comprehend the knowledge which recent observation has accumulated on the history and practice of Scurvy; and it remains to be decided now, whether or not our proximate cause corresponds with the largest stock of facts hitherto collected on the subject.

SECTION

SECTION III.

PREVENTION AND CURE OF SCURVY.

AFTER what has been said by so many able physicians concerning the prevention of Scurvy; a disease whose causes and cure, however we may dispute about their action, are so well ascertained, it may seem astonishing that it should still be the scourge of long voyages and a sea life. This, however, is in part irremediable. Few ships can be supposed to carry with them an allowance of fresh vegetables to supply a crew of some hundreds for a long cruise or station at sea. Ships of war whose motions must depend on the manœuvres of the enemy, have often suffered by the want of these articles. Thus,
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the history of the diseases of seamen, during the late war, sufficiently shows the dreadful ravages, which Scurvy continues to make on certain occasions. Even in the West Indies where actual service seldom called the British fleet, out of sight of islands abounding with fruits, the most valuable for both prevention and cure; yet there seemed scarce a period in this whole warfare, that the Scurvy did not rage in different degrees. But the wise regulations that were latterly adopted from fatal experience, in some measure counteracted the mortality of seamen; and the end of the war was remarkable for the healthy state of many ships in the West India fleet.

The prevention of Scurvy in his Majesty's ships of war, is connected so much with rules for the general health of seamen, that we shall not confine our Observations altogether to this disease: I shall, therefore, begin with
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making some remarks on the method of recruiting our navy by the impress service.

The subject of impressing seamen since the last war, has employed the attention of some able politicians; but every plan hitherto proposed, has been given up, as not likely to answer, the intention of service, or the exigencies of the state. It is a pity, however, that the inquiry should be abandoned. To keep a naval militia ready to man our fleet on a sudden emergency, has from the nature of their employment been thought utterly impracticable. The expences attending such an undertaking, seem also to frustrate any endeavour to carry it into execution. But, I am apt to believe that an establishment of seamen, on a certain plan might be supported at smaller expence to the people than at first we are aware of. Such we apprehend of the following:—

The first propofal that I have to make as a preliminary; is to take ten thousand men from the prefent eftablifhment of the army. In lieu of this reduction of the army fifteen thoufand feamen fhall be embodied, under their own officers. Thefe, when on fhore, fhall be trained as foldiers to military exercife, be diftributed throughout the country bordering on our naval fea ports, and do duty in garrifons as an army. The prefent peace eftablifhment of feamen, excluding marines, does not exceed fifteen thoufand, but with the body which we have propofed as a naval militia would make the number thirty thoufand; a body fufficient to man our fleet with feamen, while the landmen could be eafily procured.* The fifteen thoufand men, that are embarked in the different fhips, fhall be changed for thofe on fhore, at the expira-

* To complete them with landmen I would recommend the recruiting fervice, and a large bounty.

tion

tion of every three years. The cloathing of all these men, whether on board or on land, shall be a complete naval uniform; consisting, of blue jackets, white waistcoats, white trowsers, a small round hat or cap, with other articles to fit them for service. While employed on the garrison duty, the different ranks of officers and men as established in the navy shall be strictly attended to, that occasional supplies may be sent on board as wanted to fill vacancies.

I am aware that this plan may be objected to, as bringing the navy too near to the form of the army, which might change the blunt courage of our sailors. But this cannot be urged as an objection. It is customary to train every sailor on board to the use of small arms, and their duty in different parts of the ship is to stand as sentinels. It would, moreover, extend subordination and good order throughout the navy, which would effectually prevent that spirit of mutiny and disaffection that

on some occasions have likely to been attended with fatal consequences, and could not fail to add fresh strength to the naval character of these kingdoms.—But to our purpose.

During the late armament against Spain, many opportunities offered, while I was surgeon of the Royal William, a receiving ship at Spithead, of knowing and seeing the many inconveniencies attending this branch of service. But it is, perhaps, more to be wished than expected, that any regulations can forward the business, without some unpleasant circumstances, to the public or individual. In the first place I am very well convinced, that what is called the regulating of men by the different officers, was not only carelessly conducted in London, but at many other ports. Tenders were employed to bring seamen to Spithead from all the different seaport towns, between the Downs and Torbay;
many

many of these were men cruelly torn from their families, and the only department in which they could benefit society, to crowd the naval hospitals and heap expences on Government. Out of about seven thousand men received on board the Royal William, and distributed into different ships by Vice Admiral Roddam, at Portsmouth and Spithead, near five hundred were sent by sick tickets to the hospital at Haslar; this excludes all who were invalided at the monthly surveys, who might amount to one hundred and thirty more. So large a proportion as this, ought in future armaments to awaken the vigilance of the Admiralty Board to guard against it.* This would be easily accomplished by employing more regulating officers, as captains and surgeons. It is only a surgeon that has practised in the navy, and been familiar with the manners

* The five thousand volunteer seamen voted by the Irish Parliament in 1782, were many of them invalided at Plymouth after a vast expence to Government.

and

and diseases of seamen that ought to be trusted in such an employment. The men as regulated, should be immediately cleaned if they need it, and supplied with cloaths and bedding. A suit of jackets, &c. with two shirts, two trowsers, ought to be given to every sailor, who is not sufficiently cloathed. One vessel lying off the Tower has generally been deemed equal to the number of impressed men at a time; but this is a mistake. When any bustle breaks out, for some time afterwards, the ship is too much crouded, it depresses the spirits of the men, makes them averse to enter, and gives them at first unfavourable ideas of the navy. There ought, therefore, to be more ships than one, in the river Thames to receive men.

The want of cloaths and bedding seemed the principal cause of disease among the people sent from the Royal William to Haslar Hospital. In the passage round, &c. many of
them

them had been six weeks in that situation, and lying all the time on the deck. There is a method of supplying flops and beds in the navy highly reprehensible. In ships sent out to impress men in the channel, or to convey them from one port to another, the captain and purser cannot issue these articles, till the seamen have pay sufficient to clear the expence; hence they are never provided, till the commanding officer of the port, sends them to the ships where they are to remain. This uncomfortable situation, no doubt, tends to depress the spirits of impressed sailors, and adds with the disappointment they experience when returned from a foreign voyage, to pave the way for the attack of that disease whose ravages we have been describing, or some other equally fatal in its consequences.

One happy circumstance, not commonly met with, in an extensive armament, attended
that,

that, in the summer of 1790. Which was, that notwithstanding the little attention paid to the cleaning and flopping the men, yet no contagious fever of any kind, ever made its appearance in the fleet. Some alarm, indeed, was spread from the Elephant of 74 guns, but it turned out trifling, and was probably owing, to the damp, unseasoned wood, with which it has been said that ship is built.

Wood improperly seasoned will, on certain occasions, produce a sickly crew. After a long cruize of rainy and even foggy weather, we often meet with fevers in a ship, attended with all the essential symptoms and forms of the remittant kind, occasioned by marsh effluvia. It is probable that the cause of these fevers is the same in a ship as on land. Particular care ought, therefore, to be taken in drying the decks, whether after washing them or from any other cause. The stoves employed for this purpose at present are very well adapted, but they

they ought at least to be doubled in number. The advantage to be reaped from this practice, is to dry up the moisture in the least possible time, and that can in every respect be better accomplished by four stoves, which will do in two hours, what a couple of stoves can only do in four. A degree of cold is always produced during the evaporation of the water from the deck, and while it lasts is considerably below the temperature of the atmosphere. This is so much the more hurtful, as the people when exposed to it, are using no active kind of exercise, and catarrhs and rheumatisms are its frequent attendants.

It is a matter of doubt with many officers at this day, whether or not a ship's well ought to be occasionally refreshed by letting in water at the cock. This point may be very easily decided. Provided a ship can be kept perfectly dry, it is certainly the best way to admit no water at all; any little moisture in

the well, or foul air generated there, can be purified when necessary by fires. This salutary practice, in every ship, even in those laid up in *ordinary*, ought to be regularly attended to, twice a week, and oftener if there is occasion. But the orlop, the bread room, and hold, ought to undergo the same mode of purification by stoves, once or twice a week; as having little access to the air, they are soon rendered impure, which may be observed from the disagreeable smell. It is a common practice in most ships to stow away a great deal of lumber in the wings; but it is a very bad practice; draughts of air ought constantly to be thrown along the wings, equally necessary for the timber of the ship, as the preservation of health.

It may not, only, be a matter of curiosity, but of some practical utility to describe the nature and production of that suffocating damp,
which

which in some situations has been fatal to carpenters employed about the well. It is generated by the decomposition of the moisture or water in the well, when it has been neglected so long as to stagnate. This choak damp, or fixed air, is, from its composition, called carbonic acid, by the new Nomenclature. Water is said to be compounded of two kinds of air, inflammable air, or hydrogen, and, vital air, or oxygen: when suffered to stagnate it undergoes a decomposition.* The disagreeable smell of stinking water in a ship's well is owing to

* As we shall have frequent occasion to mention the decomposition of water, it may be proper to observe, that the grand experiment of M. Lavoisier, by which, all at once, this substance was deprived of the character of a simple elementary body, was performed in April, 1784. From that period we are to date the explanation of many phenomena in Nature that were till then unknown. The constituent principles of water are, therefore, found to be in the proportion of 0, 86 of oxygen, and, 0, 14 of the base of inflammable gas; this last, as being the radical of water, has received the name of hydrogen.

Although this beautiful discovery has met with keen opposition, it has been lately confirmed by both analytical and synthetic facts.

the escape of the hydrogene, while the other principle, the oxygene, is attracted by the *carbone* of the wood, and forms with it the fixed air, carbonic acid, which is found there. This kind of air, as possessing a greater gravity than the common atmosphere, always occupies an inferior stratum, and it is not till the person descends or stoops that he feels its noxious influence. It seems to act immediately on the nervous system, in causing death, by affording none of that *pabulum vitæ*, on which respiration depends.

The recovery of persons who have suffered from the choak damp of a ship's well, is to be affected by means similar to those of sudden death. The person ought to be immediately carried upon the deck, not too far from a fire; the surface of the body is to be well rubbed, all over by the hands of two or three people at a time. Volatile salts may be applied

plied to the nose, and now and then a few drops of æther or Sp. C. C. put into the mouth. Air may be thrown into the nostrils, and the motion of the breast and lungs, must be imitated, by frequent agitation of the chest and abdomen.

When the well has been long neglected, and there is a suspicion that this air may be generated in an unusual quantity, its noxious quality can be detected by lowering a lantern and candle to the bottom. As it is an air unfit for supporting flame, the candle is immediately extinguished; but if it burns freely, it is a sign that the air cannot be prejudicial to life. This air is best expelled from the bottom of the well, by charcoal stoves, or embers taken from the ship's fire: by these means in a short time, it will be so much rarified, and elevated, as to allow a portion of fresh atmospheric air to flow in and render it wholesome,

some; when the person may descend with safety.

It has been long a practice in the navy to purify the air of a ship with what are called ventilators; I am apt to believe that stoves are more effectual, as drying up moisture they preserve the wood. What is commonly called the correction or purification of foul air, is nothing more than dislodging it: the heat of a fire rarifies the contaminated part which ascends, while a current of fresh air rushes in, to restore the equilibrium.

It is only from its heat that smoke can act as a corrector of contagion; for instead of purifying, it renders the air foul. The effect usually ascribed to it of destroying animalculæ, was founded on erroneous opinions of the nature of infection. Smoaking ships with brimstone, camphor, &c. is still practised in his Majesty's Navy, all of which ought to be
laid

laid aside for the more frequent use of stoves. I have often sat in the orlop during the fumigating process, and found no inconvenience; for, as it is the property of smoke to ascend, even though the hatches were closed in, none of it came in contact with the inferior parts of the ship, which stand in most need of something to dislodge the bad air.

Before leaving this part of our subject, I must beg leave to offer some remarks on the practice of charging fifteen shillings to seamen for the cure of the venereal disease in a man of war. This will seem the less exceptionable, while treating on the Prevention of Scurvy, which is often complicated with syphilitic complaints, and the cure of each of these diseases is diametrically opposite. This custom I had occasion lately to reprobate in another publication on the medical department of the navy. The arguments I have offered against the perquisite, were principally
founded

founded, on the idea that it prevented men from making their complaints known in time; and when in port it makes them the prey of every specious impostor, with which the different sea ports abound. I have often known a sailor pay two or three guineas for medicines on shore, and be obliged to apply to the surgeon of his ship, when the disease had arrived at a degree of virulence horrid to be described. It ought, therefore, to be abolished as unjust and inhuman.* It is peculiarly unfortunate for the men if they go to sea with complaints that require much mercury; so that instead of preventing a timely application for medical assistance, by mulcting them of their pay, they ought the rather to be encouraged to make their complaints known. By the advice of a friend, in my Work a fine of five

* There was lately an instance in the Colossus, where a sailor had taken muriate of mercury, for the cure of the pox, in such quantities as to prove fatal in a few days. It is a frequent practice in ships, and similar cases have fallen under my own observation.

shillings

shillings was still to be paid; but I am now of opinion that every claim on the sailor should be abolished. With the facts sent to me by the late Mr. Young of Haslar Hospital, which so emphatically proved my assertions, it was hoped that the bounty of Government would, at least, meet us half way: but this has not yet been the case. If the surgeons are blamed for still receiving the fine, they may justly answer with the apothecary in *Romeo and Juliet*.—

“ Our poverty, but not our will, consents.”

Since the introduction of the venereal disease to Europe, it has in a peculiar manner been the scourge of the profession of arms; the roving life of the soldier and sailor, has singularly subjected them to its virulence; and the difficulty of cure, as it was, till lately, thought to be, induced the surgeons of his Majesty's

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Navy

Navy to petition the Board of Admiralty for some perquisite annexed to their office for every cure performed on ship-board. This was actually complied with; and the King in Council, ordered fifteen shillings to be paid by marines, and one pound ten shillings by the seamen, which were to be charged to their wages. The surgeons, however, not content with this allowance, some time afterwards petitioned Government afresh, to double the fine, as it did not indemnify them. But their rapacity was checked, by the then first Lord of the Admiralty, who, much to his credit, reduced the fine of the seamen to an equality with the marines, where it remains to this day.

Having said so much on these collateral, though important subjects, let us now turn our attention more particularly to the Prevention and Cure of Scurvy in his Majesty's ships.

The

The prevention of all diseases depends upon a knowledge of their remote causes, or of these noxious powers which have a tendency to produce them. The remote causes, are divided into the predisposing and occasional causes. The predisponent causes of Scurvy, are whatever have the effect of debilitating the body; the chief among them are, preceding disease, fatigue, cold, and moisture, impure air, indolence, the sedative passions, want of cleanliness, &c. But it is to be observed, that no one, or even all these causes concurring together, can produce Scurvy, without the exciting causes; they only render the body more susceptible of the disease, and accelerate its approach.

The occasional or exciting causes of Scurvy have been called a diet of salted or smoke dried provisions, without fresh vegetables. But we have considered a deficiency of recent

vegetable matter alone, as the occasional cause of Scurvy.—But first of the predisposing :

The complete mode of discipline, carried on in his Majesty's ships, at this time throughout the navy, is on the whole so happily conducted, for answering the purposes of service, and securing the health of the ship's company, that it almost anticipates any remark that I have to make. It is certainly the proper study of every officer so to regulate his ship, that a healthy crew may be always prepared for action; without this, it is in vain for physicians to prescribe rules of health. But it is not health merely, that is the fortunate result of these judicious forms of discipline: the morality of our seamen is undergoing a rapid revolution for the better. Nastiness, drunkenness, and theft, are almost banished from a man of war: the rough sailor is daily losing the ferocity of his manners, while

while the true courage that distinguishes the British Tar is increased, and blending itself with more polished notions of principle and honour. This there can be no doubt of. It must be a pleasing sensation to the moralist, to hear that some ships of the line, with a complement of 750, were really paid off, at this port, after the Baltic armament, without an intoxicated sailor appearing at the pay table. This is no less singular than true; and it is only to be accounted for, from improved discipline.

Was the learned physician, whose opinions on Scurvy I have attempted to refute,* to consult the private orders given out by the different Captains of the guard ships in Portsmouth harbour for the regulations of discipline on board, he would not think, that the

* Doctor Milman.

health of Captain Cook's crew, was owing to superior officerſhip, over the general practice in the ſervice. After performing ſo arduous a voyage, their healthy ſtate was, no doubt, wonderful, and reflected high honour on the illuſtrious Navigator. But it is to be remarked, that ſhips ſent on diſcoveries have many advantages above common ſhips of war: their tonnage is calculated to carry more water, and other things neceſſary for a long voyage. They are ſeldom long from land, and their commanders are allowed to purchaſe all reſreſhments that they ſee wanted, which others are not permitted to do at Government expence. But the health of Captain Cook's crew is not a ſolitary fact. The Intrepid, a ſhip of 64 guns, with a complement of 500 men, in Lord Rodney's fleet laſt war, did not loſe a man but what died of wounds, for the ſpace of two years and a half. This ſhip was in a very ſickly ſtate
when

when Captain Molloy took the command of her; but by the complete mode of discipline, and attention to the cleanliness of the crew and ship, which he established, health was preserved in a climate, reputed to be unwholesome; and that too, when exposed to the hardships, which follow a state of frequent or constant preparation for action.

Every officer who knows his duty, will be as cautious as service will admit of, in exposing his ship's company to either cold or rain.

The custom of dividing every ship's company into divisions and squads, under the inspection of lieutenants and midshipmen, has been productive of the very best consequences. A book with every article of their cloathing, in distinct columns is kept by the officers who superintend the different divisions: these articles are occasionally mustered: the zeal which sailors naturally have of attracting the
notice

notice of their commanders is excited and preserved; they grow emulous to appear clean, and spend their money on necessaries, that would otherwise be squandered to bad purposes; and on the whole it prevents them from selling or otherwise destroying any part of their dress, or stealing clothes from one another. By these means the articles of dress are multiplied; and in case of cold or wet weather, they have always a shift or two to put on, while their damp clothes have time to dry, till wanted. The crew of a guard ship, when mustered in a Sunday morning for church, exhibits as much good order and cleanliness, as the best disciplined regiment in his Majesty's service. It is, therefore, to be hoped, that every improvement in this part of regulating a ship's company may become as general as possible, for a healthy fleet will certainly be the effects of it.

When

When wind sails are used for cooling a ship below, or even throwing in fresh air, care ought to be taken that a free passage is left between the foot of every sail, that a fresh current may be drawn from the one end to the other, which is the only way to purify the intermediate space.

With regard to indolence and low spirits, which so powerfully and successfully operate, in the production of Scurvy, they are, perhaps, to be easier cured in a ship, by the attention of an officer than surgeon. If any person's duty calls him to study the character or dispositions, and an intimate acquaintance with the human mind; it is an officer, who has the command of a ship, or a regiment, a fleet, or an army. It is the grand point on which all military evolutions move. It is the secret, which to know, is to execute every piece of service, with address, resolution, certainty, and success. This discernment of cha-

rafter peculiarly fits the commander to become the father of his ship's company. The way that such a man dispenses his orders makes it a luxury to obey them. In the hour of danger, or season of disease, it will awaken sympathy for distress, as an inseparable attendant of a noble mind; for the health of a sailor will always interest his commander, if he possesses sensibility or goodness of heart. But to apply this reasoning to our present subject: that indolent disposition, and brooding over their own feelings, common to a number of men in the King's service, is often misconceived and imputed to very unworthy causes. I have generally found it owing to misfortunes liable to every station in life; but particularly to a seaman. His country has taken the advantage of his situation, and his service is rendered an indispensable duty for the safety of its commerce and territory. It is only, therefore, mild treatment, that can reconcile an impressed sailor

failor with his fate; and if he is so unfortunate as not to overcome it, some fatal disease as Scurvy will be the consequence. Among people of this description it first makes its appearance. But if the ship is destined to a foreign station, where he may be exposed to unwholesome tropical countries, he will be the first to suffer from remittent fevers, or dysenteries. Low spirits are found every where to predispose the body most effectually to all kinds of contagion, such as putrid fevers; so that cheerful spirits, or the active passions, when exposed to infection, are the best preservatives of health. An officer, therefore, cannot too minutely study the genius and temper of the people he is to command; but the good effects of it, and the satisfaction he will experience, will more than repay his assiduity as a man and an officer.

Having just hinted above at the fevers of tropical countries, I shall not long digress by

what I have now to say. These fevers are produced by marsh effluvia, and one of the best things to guard against them, is flannel wore next the skin. It sounds rather uncouth to wear flannel next the skin in a hot country, but the best effects may be expected from it. The surface of our bodies in all fevers, is so intimately connected with the internal parts by sympathy, and the general state of the system from disease, that however the fact may be explained, the prevention and cure very much depend upon keeping the vessels or pores of the skin in a perspiring state. I am not prepossessed in favour of this method of prevention, from any predilection for Doctor Cullen's Theory of Fever; but from having observed some sailors who wore their flannel shirts and thick woollen trowsers, escape the ague and dysentery, when others who wore check and linen suffered from these diseases, though all were alike exposed, on shore in wooding and watering the ship.

Thus

Thus far we have spoke of the predisponent causes of Scurvy.—We trust that it has been sufficiently proved from the best authorities in the preceding pages of this Work, that the most effectual means of counteracting a sea diet, will be to increase the vegetable part, and to bring that, as nearly as circumstances and situations will admit of, to the recent state.

For the Prevention of Scurvy, the British Navy, is at present supplied with Sour Krout, Elixir of Vitriol, Malt and Essence of Wort. Each of these shall be considered separately.

Sour Krout was recommended by Doctor Lind after the fashion of the Dutch Navy. It is a preparation of yellow cabbage cut in the month of November. The stalks in the heart being removed, the leaves are cut into thin slices with a large knife; which are to be strewed
in

in a cask in layers, and then covered with salt. This being done, the whole is to be well pressed for some time; a degree of fermentation takes place in a few days, and the composition becomes sour to the taste; an offensive liquor flows from it during the process, which must be carefully separated. It is then to be preserved in very close casks. When used, it is the general practice to wash it, which carries off the salt, and leaves the clean leaf of the plant, of a taste somewhat acid. When Lord Rodney sailed to the West Indies, by the advice of Sir Charles Douglas, (who, I believe, was well acquainted with the method the Dutch use it) he gave orders, that the cooks should not wash it, but boil it with the pease as it came from the cask. I cannot, however, deem this any advantage in dressing four krait. Before purified by washing, it emits a flavor extremely putrid and disagreeable; a proof that it has advanced very considerably

fiderably towards the putrefactive fermentation. Doctor Lind says, after the cabbages are washed, "their virtue is the same as if taken fresh out of the garden." That the effects of four krout have not been equal to the fresh vegetable is now pretty generally admitted: for how can any vegetable preserved in this manner retain the virtues of its recent state? The four taste shews, that it has fermented, and the stink evidently proves the strong disposition to putrefaction, which even the great quantity of salt is unable to prevent. On the whole it appears to me, from both reasoning and experience on the subject, that it is not worth the expence which it has cost Government; its virtues as an antiscorbutic, are very trifling, and I apprehend it might be advantageously laid aside, for some other preparations to be mentioned hereafter.

The

The *Elixir of Vitriol*, was, I believe, first introduced to the navy by the late Doctor Huxham, of Plymouth. It is usual for surgeons still to demand it, but not from any view of its being either capable of preventing or curing the Scurvy. When diluted powerfully with water it is commonly used as a gargle to the gums and mouth; but in this way it is a mere *placebo*. The sulphur which is the base of this acid, has so strong an attraction for the oxygene, that it is incapable of being acted upon, by the powers of digestion and assimilation, or converted into animal fluids; hence it passes unchanged, through the body without exerting any effects on the blood.

The *Infusion of Malt*, and the *Essence of Wort*, or more properly the *Extract of Malt*, were first supplied to his Majesty's ships, from the recommendation of Doctor M'Bride. Their
supposed

supposed efficacy in curing the Scurvy was held forth in his doctrine and experiments on fixed air. About that time Doctor Black had published his celebrated Experiments on Magnesia and Quicklime. It was there, that modest philosopher discovered the wonderful agency of the elastic fluid, fixed air in the operations of nature and art. He found that its presence rendered lime and the alkalis mild, and that their causticity was owing to its escape. These discoveries gave birth to a new æra in chemistry; and Doctor M'Bride, delighted with the subject, determined to apply the doctrine of this cementing principle, as he called it, to the cause and cure of diseases. He, therefore, considered the want of this principle, to be the cause of putrefaction in the human fluids; and that by restoring it to the blood, the diseases arising from a putrid diathesis would be prevented and cured. A quantity of fixed air he knew was always generated during the vinous fermentation, so that by throwing sub-

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stances

stances into the stomach capable of this process, he thought that he could restore the bond of union, and resist the putrid tendency of the blood. Few doctrines in medicine appeared more plausible, and it was very universally supported. Besides the experiments, instituted on purpose by Doctor M'Bride, it agreed with those of Sir John Pringle, and the popular opinion of antiseptics at that time; so that nothing remained to establish its credit, for the cure of Scurvy, but a trial in the living subject. This was accordingly done; and the surgeons of the different ships where it was tried, gave so favourable an account of its efficacy, that the Lord Commissioners of Admiralty from that period to the present day, have ordered it as a part of naval victualling. Without at all saying any thing of the putrefaction of the fluids, a doctrine that I have long ago relinquished, as not to be defended, the fundamental part of Doctor M'Bride's opinions totters on its base, from the accumulation

mulation of knowledge, and the extent of experiment which chemistry has gained since that time.

The Malt which he so warmly recommended as abounding with fixed air, has been lately more accurately analyzed. Barley, by being malted, acquires a saccharine quality, a quality without which the vinous fermentation cannot take place. Upon the affusion of hot water this sugar is extracted from the malt, with a mucilaginous substance peculiar to the barley; so that wort, or the infusion of malt, differs very little from melasses dissolved in an equal quantity of water. By adding a ferment to the one, you acquire *Sp. frumenti* or whisky: and from the melasses you procure rum. When whisky and rum are rectified by repeated distillations, you get pure *Sp.* of wine, or *alcohol*, as it was called by the Arabians, which is the radical spirit of all fermented liquors.

But let us inquire how fixed air is generated during the spiritous fermentation. Besides a saccharine mucilage, a degree of fluidity, a heat from 55° to 65° of Farenheit, and free access of the air, are required in the operation. The fluid is decomposed in the process; its oxygenous part combines with the carbonaceous matter of the sugar, and forms carbonic acid, which is the fixed air we are speaking of; the hydrogen, the other principle of the water, uniting with the oil of the saccharine body, constitutes the inflammable spirit or alcohol. How such a process as this could be conducted in the human stomach, would be difficult to explain; the bare mention of it is sufficient for its refutation. Wort may be drank with as little inconvenience as water, making allowance for a purgative effect from the sugar: but it is very different if a ferment has been added to it, and the fermentation not completed before the wort is taken into the body: it then excites a multitude of disorders;

orders; such as distention and flatulency of the stomach and bowels; hence borborygmi from these, severe gripes, purging, and tenesmus. All these symptoms we experience from new ale, imperfectly fermented, cyder, perry, wine, &c. The simple wort passes easily through the body, undergoes no decomposition in the stomach, and cannot give out fixed air to the blood, till it goes through a regular spiritous fermentation. The same kind of air generated by the fermentation of all fresh vegetable substances is to be accounted for in the same manner; and the very process necessary for its production, abundantly refutes the supposition, that this is the principle which they restore to the body for the cure of Scurvy.

Although I have no idea of impeaching the veracity of those gentlemen who established the credit of the malt preparations; yet I must beg leave to observe, that in my own practice I have not seen it attended with any
good

good effects. It may be nourishing from the sugar it contains; but there are certainly testimonies sufficient on record to expunge it from the list of articles that can cure this distemper. Doctor Lind speaks coldly of it, as a very nourishing liquor, well adapted for scorbutic patients;* but not one cure out of 130 men to whom it was given.—The Theory founded by Doctor M'Bride, brought into repute the fixed air to be given in other forms and preparations.

The *Carbonic Acid* of the New Nomenclature, was known before any of the other elastic fluids. It has received names from the various bodies it is combined with. Doctor Black called it fixed air. The Swedish chemists found it to possess the properties of acids, and as abounding in the atmosphere, they gave

* Page 539, vid. note.

it the name of aërial acid. It is found in chalk, and called the chalky acid; and lastly, from its being composed of carbonaceous matter, and the acidifying principle or oxygene, it is called the Carbonic Acid, by Messrs. Lavoisier, Morveau, &c. Doctor Dobson wrote a Commentary expressly on the medical effects of fixed air, and he speaks of some successful scorbutic cases, from its use in the Liverpool Infirmary. I am apt to believe that the use of fresh vegetables was overlooked at the time of these cures, as well as in some others related by authors. The theory that gave it birth is now done away; but the supporters of another proximate cause, relying upon its efficacy, and the testimony of those physicians who vouch for it, ascribe its antiscorbutic effects to a stimulant quality. This stimulating quality we observe from a momentary intoxication it occasions when taken; but it is so transitory, that it can have little effect; and it would be too fanciful to suppose that it could ever restore

flore to the body, what has been abstracted by deficient nourishment. But in applying it to our theory of Scurvy; as being an acid, and compounded of a certain base, and vital air, something might have been expected from it. The disappointment, however, is to be accounted for in this manner. Of all known bodies, carbonaceous matter appears to have the strongest attraction for vital air, hence their decomposition in the carbonic acid is found to be the most difficult. Thus like many other acids it cannot be acted upon by the animal process, although it may join itself with other substances before it passes through the body.—So much for this pretended antiscorbutic.*

Pure

* Mr. Skinner, an ingenious Navy Surgeon, I have been told, has invented an instrument for giving the citric and other acids, and alkaline salts, in the state of effervescence. He had suspected that the stomach

Pure Water may be very justly reckoned a preventor of Scurvy, and to preserve it in that state, a valuable acquisition with salted provisions at sea. Water does not seem to be decomposed in the body, at least, there are no experiments to confirm it; for though all the humours owe their fluidity to the water they contain, yet it can be separated from all of them without any decomposition of its constituent principles. The greatest quantity, however, is thrown out by urine and perspiration, in which are dissolved various salts, elaborated during the process of assimilation. A larger supply of this menstruum is, therefore, more necessary at one time than another; for

mach was a *vacuum*, and that the carbonic acid was not disengaged from the alkali, from the patient perceiving no uneasiness, such as distention, rustations, &c. But had the human stomach been a *vacuum*, it would not have prevented the acid from combining with the alkali, for the access of air is not necessary to their reciprocal attraction: and with regard to the patient feeling no uneasiness, it could scarce be expected that any distention of the gastric region could take place, from the small quantity of carbonic acid, set free from any proportion of alkali that has ever been exhibited.

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instance, where any foreign substance is taken into the body, as marine salt with sea diet; a desire for liquids immediately follows, which continues till a quantity has been supplied, fully to answer the purposes of nature. Putrid water has been always reckoned among the causes of that disease of which we are treating; but that has, perhaps, originated more from its offensive smell than any bad quality it had acquired. Water of itself is incapable of undergoing any fermentation whatever. When confined in wooden casks or vessels, and not exposed by agitation to the influence of the air, it soon emits a disagreeable flavor. The agitation of water, therefore, is always necessary to preserve it pure if it comes near any substance that can assist the separation of its principles. In glass bottles it may be preserved sweet for a length of time; but in new casks, it spoils very quickly, owing, no doubt, to the unseasoned wood, abounding more with the carbonaceous matter than old ones. The stinking

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ing smell is, therefore, produced by the escape of the hydrogenous gas, or inflammable air, while the vital air or oxygene which it has left joins itself to the carbone of the wood, and forms the carbonic acid or fixed air found on these occasions.—We shall now apply this reasoning to the means of restoring its sweetness.

Many very opposite substances have been recommended at different times to purify water. That water is purest which upon analysis, is found to contain no foreign body; but consists of only the due proportion of the two principles which compose it. This seems the reason why river water is not only more fit for domestic purposes than spring water, but can be preserved sweet for a longer time. The agitation which it undergoes in its course, and exposure to the action of the air, seem to precipitate many of these unpleasant qualities it may have imbibed in its passage through dif-

ferent strata. Thus the Thames water is preferred to others for a long voyage; but its superior excellence is owing to long exposure to the air, by the length of its course, and not to any pretended fermentation which is said to take place.

How quicklime came to be used at first for purifying water, I am at a loss to determine, unless it was from its attraction for fixed air which is generated during the decomposition of the fluid in the casks. We have attempted to explain the formation of this kind of air in wooden casks, on the principles of the Pneumatic Theory, which, the more it is extended, gains stability by multiplying facts. But quicklime absorbing or rather attracting the fixed air, does not sweeten the water. Had this air alone rendered the water disagreeable, its taste would have been acidulous; but the taste of water in this situation is indiscrivable; its smell comes near to rotten eggs. But an acidulous taste communicated to water by other acids,

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as the sulphuric, tartareous, &c. does not correct the smell.

Mr. Osbridge a lieutenant in the navy, has contrived what philosophers long sought after in vain, an easy and expeditious method of sweetening water, by a very simple machine. The construction of the instrument as being common needs not be described. Without knowing or reasoning any thing on the principles of water, his sagacity taught him, that by exposing it to the influence of atmospheric air, when putrid it would become sweet: the operation, however, might be much shortened, by contriving the machine so, that a current of air could pass right through it. The water thus exposed by agitation, to the action of the air, has its hydrogen, from which the disagreeable flavour arises, gradually dissipated and carried off; or perhaps the superabundant

bundant quantity of it, attracts oxygene from the air, and again composes water.*

Boiling also restores the sweetness of stinking water, and is to be explained on the same principles. The hydrogen, a highly volatile elastic

* Duke, Portsmouth Harbour, Jan. 12, 1792.

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Having just heard of the Society's proposed premium of a gold medal, or fifty pounds, for the best account, verified by satisfactory trials of an efficacious method of preserving fresh water sweet during long voyages, at a time that I had turned my thoughts to the subject, in finishing my Observations on Scurvy; I am, therefore, induced to offer you a few remarks on this important inquiry.

It would be endless for me to recount the various conjectures of philosophers, and the numerous experiments of chemists, that are to be met with in books on this investigation. Suffice it to say, that till lately, their labours have been fruitless. The subject has now assumed a new appearance; and where the famous Lavoisier and his learned associates have left off, the present inquiry ought to begin.

If it has been proved, as I apprehend it is, as clearly as any chemical fact whatever, that water is no longer to be considered as a simple elementary body, but a compound of two kinds of air, viz. vital, and inflammable airs, as commonly expressed: this composition, and their decomposition, which depend upon the laws of chemical attraction, certainly point out to us very novel ideas for preserving it pure and sweet

elastic fluid, is immediately separated by the heat, sublimed and carried off into the atmosphere. The water is then left pure, and without any putrid or disagreeable smell whatever; but as heat also expells the common air it is not equal to the other method.

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sweet in long voyages. It is well known, that glass vessels when corked close, or earthen jars well glazed, and stopp'd, preserve water for any length of time. Now what does this depend upon? The water is incapable of acting upon these substances; it finds no substance that has a stronger attraction for either of the gasses of which it is compounded, than they have for one another. In this manner it remains sweet, and would remain so for ever. But if it is put into a wooden cask, and particularly a new one, very different phenomena takes place. Water is incapable itself, of fermentation in any situation; but the changes which take place in the fluid, in a cask at sea, are to be easily explained.

On opening the bung of a cask where the water stinks, a volatile elastic vapour is immediately set at liberty: a putrid smell is perceived, and if a lighted candle comes in contact with it, it takes fire. This elastic vapour is nothing else but inflammable air, or the hydrogenous gas, of the New Nomenclature. The manner of its disengagement is, shortly, thus: the wood possesses a large proportion of carbonaceous matter, which attracts the oxygene of the water, and leaves the hydrogen free. Fixed air or carbonic acid is, therefore, constantly generated in a cask of stinking water; this is proved by adding a little quicklime,

The manner of purifying water naturally leads us to the distillation of salt water at sea. Mr. Irvine obtained from Government a premium of 5,000*l.* for the invention, though Doctor Lind, on the best grounds claimed it as his. Whoever was the contriver of the best and easiest method

lime, which combines with the acid, and it is thus reduced to its original state, limestone.

Now this description sufficiently shows the futility of former reasoning on the subject; and from it too, we learn that no substance added to the water, at least, any that is yet known, can either preserve or recover it. The only method yet invented is by exposing it to the atmosphere, as by the machine of Lieutenant Osbridge: this process also confirms our explanation; for the hydrogen is either dissipated or attracts oxygen from the surrounding air to restore sweetness to the water.

Since we find that an old cask preserves water better than a new one, it is more than probable, that what is commonly called *seasoning* is nothing more than exhausting the principle of the wood, which favours the decomposition: and I am apt to believe, that by imitating this process there is a possibility of rendering wood, equally fit for preserving the fluid sweet, as porcelain or earthen ware.

For this purpose I would recommend the staves of the casks when ready to be put together, to be steeped for a length of time in a pond filled with water; this ought to be allowed to stagnate, so as to favour the

method of conducting the distillation on ship board, with the least expence of fuel, was certainly the man most entitled to the bounty of Government. Neither of these gentlemen had any merit or claim, by discovering that fresh water could be procured from salt water; it was

the decomposition of the water. The sooner, therefore, the pool becomes putrid, and the longer time that the wood is immersed in it, the more perfect will be the *seasoning*.

Had I undertaken experiments of this kind as a candidate for the Prize Medal of the Society, you will observe, from the nature of the subject, they could not be fully decided in the time you have appointed. I would beg leave to suggest it to the consideration of those Gentlemen who conduct the chemical department; whether, from the late rapid progress of experimental philosophy, there would not be some propriety in changing the statement of the question. From the experience I have had of a sea life, I cannot hesitate a moment in declaring this to be the most eligible method. There were many instances during the late war, where ships on foreign stations, by having well seasoned casks, and having never been under the necessity of unstowing their holds, found the water pure and sweet at the end of four years, as when they left Spithead. But unseasoned new casks will spoil the water in ten days or a fortnight: oak casks have also, from the hardness of the wood, been preferred to all others.

If what has been said is at all consistent with matter of fact, from the representation of your most respectable Society, I have no doubt

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was well known to chemists before them, that sea water was the pure fluid, in which were dissolved salts of various kinds, but particularly marine salt. The apparatus now in use in his Majesty's ships for this purpose, is fitted to the tops of the boilers, so that the process can be conducted in one boiler, while the victuals are preparing in the other, by which means coals and wood are saved. Every officer ought to be made acquainted, that only a certain proportion of pure water can be obtained from a given quantity of the salt water. What flows first from the still, as being the most volatile, is the purest; so that it will be pro-

but the Commissioners for victualling his Majesty's Navy, might be persuaded to order some experiments to be made for seasoning the slaves in the manner directed above: such a representation, I suspect would be little attended to from an individual.

I am, Sir,

Your most obedient, and humble servant,

T. TROTTER.

To the Secretary of the Society
for Arts, Manufactures, &c.
Adelphi, London.

per

per to have only a slow fire. The water as it comes over ought to be frequently tasted, and the moment that any thing disagreeable is perceived, the distillation must go no farther. The whole quantity of distilled fluid may now be passed through Osbridge's machine, which will rectify any unpleasant flavour, by impregnating it with common air. If conducted in this manner, the water will be found pure and wholesome as any that comes fresh from the fountain. I would recommend it to every Captain in the Navy, when he sails for a long cruize, or when he suspects a long passage, not to wait for this expedient till his ship's company may be in want of water, but to begin the operation as soon as he goes to sea. By this timely precaution, he will have provided a stock for any emergency; the water will have the chance of being of a better quality when he is not under the necessity of pushing the distillation too far, which might impregnate the whole with some disagreeable substance.

We come now to mention the provisions used at sea, and what alterations we propose, shall be perfectly compatible with the situation, avoiding all refinements whatever. We have before given it as our opinion that the salted meat used in the navy at present, is prepared in the greatest possible perfection, and reflects the highest credit on that Board which superintends this department of the public service. The allowance of butter and cheese that is served out in King's ships is so small a proportion to the other parts of diet, that it scarce deserves notice. The vegetable part of the provision, consists of biscuit, flour, and raisins, to be made into puddings; oatmeal, of which bargou or a thick gruel is made for breakfast; and pease, which are boiled as soup for dinner. Every mess at sea is occasionally served with vinegar, and four krout has been more carefully supplied of late, as also melasses, which are mixed with the bargou for breakfast. The allowance of small beer is, perhaps, more than what most men consume in
twenty-

twenty-four hours; it is generally of an excellent quality, and when served otherwise to the people, it must be from a want of attention in their officers. The beer seldom lasts more than a fortnight at sea, and on foreign stations it has never been supplied at all; spirits and water, which is grog, or wine have therefore been substituted, neither of which are to be compared to this salutary beverage as an antiscorbutic.

While a ship is in port and fresh beef allowed, every officer ought to be attentive to the quantity of greens, that are boiled among the soup. Small as this allowance is, it is often shamefully perverted to other purposes. Government would do well, at least thrice in a week, to allow a much larger proportion of vegetables, consisting of all these in season to be mixed with the fresh beef broth. It is in this manner only that a ship returning from a cruize or long voyage can best recruit a sickly crew; and reco-

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ver them in a very short time for the emergencies of service.

It is much to be wished, that it were a general practice in the navy, when a ship goes to sea, to diminish the allowance of salted meat, and, if necessary, increase the other articles of diet. This method can be defended on the best foundation; as the beer lasts generally so short a time at sea, and the water not always plenty; it is in some measure making up for both; for the less salted meat made use of, a smaller proportion of liquids will be wanted to dilute them in the stomach, and carry the salt out of the body. This practice is confirmed from experience, and does not clash with any Theory on Scurvy.

On the Jamaica station some time last war the Captains of several ships, ordered their purfers to furnish the men with cocoa and sugar, in lieu of oatmeal, butter, and cheese. I have not
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been able to learn the names of these officers who thus distinguished themselves by their judgment and humanity; their example, however, has made it general in the West Indies, and it has now received the sanction of Government. The oatmeal, butter, and cheese, are three articles very liable to spoil in hot countries, and cocoa has been wisely substituted in their room. A breakfast is the most deficient meal in a seaman's diet; and if this alteration has been attended with so many good consequences abroad, why not extend it to the home stations? It is in a cold country where it would be singularly beneficial: what a comfortable meal would a cup of warm cocoa or chocolate be to a sailor in a winter cruise in the channel or north sea, on coming from a wet deck in a rainy morning watch! This mess is, besides, extremely nourishing. Cocoa abounds with a vegetable oil and mucilage, approaching nearly to an animal nature; and is, upon the whole, one
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of the most valuable additions to a sea diet that has ever been invented.*

It has been frequently proposed to Government to supply ships abroad with porter; in support of which measure, strong evidence is produced of its antiscorbutic qualities.† I have no doubt of porter being a valuable antiscorbutic, or rather a preventive of Scurvy; but I am afraid that a general supply to the navy is scarcely practicable. Porter only differs from strong ale, by adding a quantity of liquorice juice, and some narcotic substances, such as the *coculus indicus*, &c. What I apprehend would be of equal advantage is, that the beer which is to be carried to sea, may be made one half stronger, and only two quarts allowed in the day instead of the gallon, as at present. Most ships would be able to take

* It ought to be remembered that seamen in general are very averse to the use of bargou, even when sweetened with melasses.

† Doctor Blanc.

a supply at a time, equal to six or eight weeks expenditure: being stronger than the common small beer, it could be kept much longer, and as containing an equal proportion of saccharine matter would be equally antiscorbutic. This strong beer as being preferable to malt in an unfermented state, such as the essence of wort, would also in a great measure supersede the use of wine and spiritous liquors; but some political reasons besides those which regard health justify this proposal; the malt, as being a production of the country, ought rather to be preferred, for the consumption in time of war would be immense.

When speaking on the proximate cause, I had occasion to mention, that wine possesses little of that quality, which we value in the cure of Scurvy, although it abounds with an acid. I have seen it taken with much reluctance; but even when it has been duly persisted in, and in large quantities too, it neither

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seemed to cure or retard the progress of the disease. Low spirits, despondency, and apprehension about their safety, are almost constant attendants on Scurvy; yet when they have approached the extreme degree, wine is received with indifference. Very contrary to this is the appetite for wine in Typhus; the desire for it there, is marked by the most anxious satisfaction on receiving it, and it has been observed, that when the indication of wine was doubtful to the physician, it was the best practice to leave it to the cravings of the patient.

With respect to diluted spirits or grog, instead of wine or beer, it is certainly an unsalutary substitute. The use of it ought to be checked by every prudent precaution. Whatever exhilarating effects and pleasing sensations it may excite, it is, of all stimulants, perhaps, the most dangerous to indulge in. Beer and wine, as abounding with sugar and mucilage are nourishing and healthful; but diluted
spirits

spirits have a very contrary tendency. Grog exhausts and debilitates the constitution; as communicating a more sudden stimulus to the stomach it is, of all liquors, the most likely to induce a habit of dram drinking, with all its horrid consequences.* A quantity of sugar ought, therefore, to be always mixed with the spirits and water; orange, lime, or lemon juice where they can be procured, which make an artificial wine, may be added, as rendering the composition still more salutary and antiscorbutic.

As correctors of salted provisions, and the best condiments for animal food, I would recommend pickles of red cabbages, cucumbers, kidney beans, onions, &c. prepared in the same manner as for common use at table. A proportion of these might be served on the

* Vide the Author's Inaugural Dissertation, De Ebrietate Ejusque Effectibus in Corpus Humanum. Edit. Edin. 1788.

days that salt beef and pork are issued to the ship's company. I will not argue that these pickles will cure Scurvy or even prevent it on all occasions; but certain I am that their effects will be superior to the stinking preparation of yellow cabbage at present in use. They will keep for any length of time, as being pleasant and grateful to the taste, and needing no kind of cooking whatever, which is a very essential advantage at sea, they cannot fail of being acceptable to seamen. It may be worth while to remark that these articles can be purchased for the same expence that Government generally pays for four kroust. But to serve them alternately with the kroust, would make both more beneficial, for I should be very glad to see them introduced into the navy in any manner.

In those stations abroad, but particularly in the West Indies, where vegetables can be procured at an easy rate, such as plantanes and
yams,

yams, it would be a very good practice to allow them twice a week in lieu of bread when the ship is in harbour. It is difficult to preserve bread from insects in warm countries, and I know no better substitute for it than plantanes and yams. The fruits of the climate ought also to be frequently served out to the seamen, both as amusing them and for the preservation of health. It ought to be remembered that their wages are never paid abroad, consequently they have little chance of sharing such dainties: officers themselves who have it in their power to procure these delicacies at their own tables, perhaps, think very little about their ship's company, though such articles are highly essential to their welfare.

People recovering from fevers, or other diseases, by which they have been much reduced, ought not to eat the common fare of the ship till tolerably recruited in health and strength. The breakfast of cocoa which we have recommended,

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mended, would be a luxurious meal at sea to the convalescent failor; with this and the portable soup, and a pint of wholesome port wine, which is the allowance when the beer is expended, they could not fail to recover. A very comfortable supper may also be procured by slightly fermenting oatmeal, and making flummery of it. This was a constant mess to the sick and convalescents in the Berwick, when commanded by Captain Keith Stewart, now Rear Admiral of the Blue. When properly prepared and a little wine and sugar added, there cannot be a more palatable sea meal. Other articles for this purpose, such as rice, currants, barley, and sugar, are supplied among the surgeons necessities; but the quantity allowed of each is so small, that in sickly states of a ship they are by no means sufficient.

We are now to speak to the cure of Scurvy. From what we ourselves have seen of the disease, or learned from the writings of authors,

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we believe that fresh esculent vegetables of all kinds will cure it; but that those fruits abounding with an acid, such as the citric class, are more effectual than others. Most vegetables possess in their recent state a portion of acid, though so small as not always to be perceived, and in proportion as it abounds in them, and perceptible to our taste, they have a superior antiscorbutic quality. The lemon, lime, shaddock, and orange, in the manner we have set them down, give out the citric acid in different degrees of purity. This genus of fruit has advantages above all others, for as it approaches to maturity, the acid is not altered for the worse, but rather purer than before. The unripe gooseberry has the citric and oxalic acids combined in its juice, and there can be no doubt but it is equally effectual as the lemon. I recommended this to be carried to sea; and have since seen in a newspaper, where a number of scorbutic sailors, in an East Indiaman were cured in their passage outwards by some
unripe

unripe gooseberries that were preserved for making tarts. The malic acid is pure in the apple just before it is ripe, but it has less afterwards. The last case of Scurvy which I treated was cured by apples.—This, with the recovery of the seamen in the *Berwick*, at Torbay, sufficiently proves that apples are valuable antiscorbutics.

The cases in which I last administered the juice of lemons and oranges for the cure of Scurvy are worth narrating. Some time in November, 1789, eighty Irish convicts came from Newfoundland in company with the ships returning from that station to England. These convicts to the number of 130 or 140 had been shipped at Dublin some time before. The master of the vessel in which they sailed, had orders to land or dispose of them, somewhere in the territories of the United States of America. Instead, however, of fulfilling his contract with Government, and obeying orders, he

he resolved upon making the best bargain with his prisoners. Those who had cash paid it to him for their liberty; among the rest was a noted Roman Catholic priest, who had been convicted of forgery. When he had stripped them of all the money and clothes which they had, they were, men and women, turned on shore in the Island of Newfoundland. Here, with the little provision he had given them, they were to make the best of it. Some perished in the woods from hunger and fatigue, and others reached different settlements in the Island. The circumstances of their situation soon reached Vice Admiral Milbank, then commander in chief on that station, who ordered them to be collected and secured, and a ship fitted to carry them to England. They remained in Portsmouth harbour till the Deptford, a navy transport, was ordered to convey them to Dublin, under convoy of his Majesty's sloop Drake. The sloop and transport went to sea, and were obliged to put back to Cowes Road in distress

of weather, about the 20th of December. The master of the transport, at this time, complained to Captain Countess of the Drake, that the convicts were in a very unhealthy state, and begged he would order his surgeon's mate to visit them, the surgeon of the Drake being then absent. The young gentleman had been a stranger to the diseases of seamen, and immediately pronounced that the gaol fever had broke out among them. This opinion he conceived from the debilitated state, the fetor about them, but particularly the large livid spots which appeared in different parts of their bodies, and the desire which many of them expressed for acid fruits and vegetables. Captain Onslow, then commanding at Portsmouth in the room of Vice Admiral Roddam, transmitted Captain Countess's report to the Lords Commissioners of Admiralty, who, by return of post, ordered two surgeons to survey the convicts, and report their situation. The surgeon of the Magnificent with myself, was ordered on this business.

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The first man who made his appearance, plainly shewed that the disease was Scurvy; and when we came to inquire more particularly into their history, as related above, there could be little doubt that the complaint was general. From the time that they embarked at St. John's in the Island of Newfoundland till now, they had lived on ship's provisions, without any fresh vegetables whatever, at the rate of two-thirds allowance. Never did I behold together so many wretched fellow creatures. Those that were cloathed had not shifted for many months; but the greater part of them were naked, even without a shirt; a hammock tied round their shoulders by a rope yarn was their only shelter from the cold, and at the same time without a bed to lie upon. It ought to be remembered it was now the middle of winter, and the weather for some time before had been wet and boisterous.

In our report to the commanding officer of the port, we recommended an immediate supply of recent vegetables, cloathing and bedding; all of which, much to the credit and humanity of the Admiralty Board, were granted, with a surgeon and what assistance he chused to call in to attend them.

Few of them were without some symptom of Scurvy, such as spongy gums, livid spots on different parts, and contractions of the hams, &c. This last symptom has generally been accounted for from blood effused in the interstices of the muscles, or into the cellular texture. Such an explanation is, indeed, very mechanical, but it is not a good one. Had this rigidity and contraction been owing to pieces of coagulated blood, there must have been some perceptible swelling or distention of the parts; but none is to be observed: the thigh is shriveled and less in circumference than in an healthy

healthy state; the tendinous fibres are also to be traced by their hardness, till they are gradually lost in the belly of the muscles. Besides if that explanation could be admitted, we might with equal propriety say, that the Trismus and Tetanus, which were met with among the black people, were produced by the same means, viz. lumps of cloated blood, distending the temporal, masseter, and other muscles, which move the lower jaw upwards. And in Tetanus, how can it be supposed, that the whole muscles of the body could be thrown into a rigid contraction, from any cause of this kind. These conditions of the muscular fibre are, certainly, much better explained from the diminished nervous energy: it is this torper of the *vis vitæ*, which produces the *hebitudo animi*, and renders the mind as well as the body so little disposed to be effected by the usual stimuli; and is a state of the nervous influence more peculiar to Scurvy than any other disease. *

* Doctor Blane says, he dissected some subjects, and found no *ecchymosis*.

Bedding and cloathing being immediately furnished to the convicts by their Lordships' orders, the cure of Scurvy was begun with lemons and oranges. At the same time they had beef and mutton broth, in which were boiled cabbages, onions, &c. In distributing the fresh fruit among them, the only rule that I went by, was to give most to those who had the worst symptoms of the disease. Their recovery, as is commonly remarked in the Scurvy, when plentifully served with acid fruits, was astonishingly rapid; for on the eighteenth day of my attendance, they sailed for Dublin, where they arrived in ten days after, in perfect health and spirits.

The great desideratum in long sea voyages is some preparation of the citric acid, that preserves all its virtues for a length of time. Different forms have been tried for this purpose. The extract recommended so warmly by Doctor Lind, has been found by Captain

Cook

Cook and others of little or no effect. It could scarcely indeed be expected that any preparation of this kind could retain the virtues of the recent fruit. It is not only the water that evaporates, but the acid is carried off with it, and the taste of the remaining juice has, manifestly, less acidity than when it was squeezed from the lemon; its powers were not, therefore, concentrated by that process. A much better method is to bottle up the juice immediately as it is squeezed and strained. By letting it stand to clear, it is said that the mucilage may be separated, which is the cause of its acquiring a mouldiness and disagreeable taste; But what we gain in one way by these means we lose in another; for during the depuration and precipitation of the mucilage, a fermentation begins, which very materially alters the acidity of the juice, and destroys its antiscorbutic qualities. If, therefore, the lemons are fresh, as they ought to be, with their rind hard and full of aroma,

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the liquor may be corked up instantly, to preserve it in perfection.

The best method of giving the lemon or orange juice, is to allow the patient to suck it from the fruit. With little trouble the entire lemon may be preserved for the longest cruize in tight casks; and this is, of all others, the surest way of securing the virtues of the citric acid.

But other methods of concentrating and preserving the citric acid, have been lately practised by different chemists. The following process for concentrating the acid juice of citrons, and rendering it unalterable, was published some time ago by Mr. Georgius, in the Acts of the Academy of Stockholm. He directs the juice to be kept for some time in the cellar, (I suppose where it may be cool, and not liable to fermentation) in inverted bottles, in order to separate
from

from it a part of the mucilage; and then to expose it to a cold, from 21° to 23° of Farenheit's thermometer. The aqueous part freezes, carrying with it, as it would appear, a portion of the mucilaginous matter; care must be taken as the ice forms to separate the liquid from it, and the congelation must be carried on till the ice becomes acid. The acid thus concentrated is reduced to about one eighth part of its original bulk.

This preparation has not yet been tried in practice for the cure of Scurvy, but there can be no doubts of its good effects. It is much to be wished that Government should patronize a trial of the acid concentrated in this manner; for when prepared as it ought to be, it will keep for ages.

The juice of lemons and limes has been often recommended by some of the oldest writers to be used externally to the swellings, rigid

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limbs,

limbs, and ulcers of Scorbutic patients. A surgeon in Lord Rodney's fleet last war, we are informed by Doctor Blane, found much benefit from it, applied to sores in the form of a poultice. It was a common practice with the slaves in the Guineaman to wash their ulcers with lime juice; but I never thought of attributing their speedy cures to the external application, while they were using the fruit internally. This reminds me of a late French author, whose name I do not at present recollect; but writing on the doctrine of transfusion, he was so much attached to his favourite subject, as to recommend the juice of lemons to be injected into a vein for the cure of Scurvy, because it would be more effectual by being directly mixed with the blood, and not exposed to the changes it might undergo by passing the process of digestion. We have yet to learn, whether there is any topical application that can cure a scorbutic ulcer, where fresh vegetables cannot be procured. The state and condition of these sores are so
speedily

speedily altered after the use of the acid fruits, that it almost exceeds belief; hence we are apt to believe that external applications used at the same time have been of service.

When a ship returns to port with a number of scorbutics, they ought by no means to be moved till they have been so much recruited on board, by refreshments from the shore, that they can be sent to an hospital without danger of expiring when they come to feel the external air. When the Berwick came to England, after the hurricane in October 1780, upwards of two hundred men were landed from her, bad of the Dysentery and Scurvy. From the time of the hurricane till she came to Spithead, no less than thirty of her best men died of these diseases; five of the scorbutics perished in the boats between the ship and the hospital. When this dreadful gale happened, by which the Thunderer went down, and the other ships totally dismasted, the crew of the Berwick were

remarkably healthy. There were, at this time, in the sick list only two men; a servant of Captain Stewart's, who was confined of the flux from the day we left Jamaica, and a sailor who had been tapped some time before for the dropsy. But the Flux and Scurvy soon made their appearance afterwards, and were probably very much accelerated by the fatigue which the men underwent, by the wet bedding, and provisions, particularly the bread being damaged by the salt water during the tempest. In the Dysentery I was, myself, a sufferer; and owed my recovery very much to the liberal use of wine, for every article of medicine, excepting pulv. ipecac. and bark, were destroyed, with all our cloathing by the motion of the ship, which became violent, beyond description after the loss of the masts. It seemed not a little surprising that the man who had the dropsy, and was emaciated almost to skin and bones, though sleeping among the rest of the sick, yet he escaped both diseases, and recovered perfect health

health afterwards at the hospital. It may be worth while to relate, that when I was seized with the Dyfentery, another gentleman who lived with me was taken ill at the same time. The coppery taste common at the attack of this disease, was so remarkable at the commencement of the nausea, that we formed the strongest suspicions of having taken poison in some pea-soup. We had immediate recourse to an emetic; the other gentleman, by vomiting freely, was next day perfectly free of complaint, and escaped; while the emetic which I took had no effect whatever, and the consequence was, that I was reduced to the last state of debility by the disease. In the mouth of the channel we fell in with two frigates, who supplied us with a little opium: the effects of it were astonishing; it seemed with myself and others to produce an instant cure. This medicine has been often cruelly withheld in Dyfentery, from mistaken notions of its proximate cause; but much practice since that time fully convinces

convinces me, that its effects in this disease, particularly when the *tormina* are severe, are greater than in almost any other complaint where we administer it. After the intestines, therefore, have been well emptied, it ought to be given in large quantities, and duly persisted in throughout the course of the disease.

When service requires a large fleet for a length of time to keep the sea, it is much to be wished, that there were vessels appointed to supply the ships with fresh fruit and vegetables occasionally. There are few stations where they could not be procured; a small vessel or sloop of war going now and then to Lisbon would provide a channel fleet with these articles. Apples are seldom so scarce in Devonshire, but they may be purchased at a moderate price, and would be very acceptable at sea. But besides fruits, all esculent vegetables in season ought to be sent out to a cruising squadron, by vessels stationed for the purpose. Naval service,

service, however urgent, seldom comes in opposition to these humane regulations. What a satisfaction must it be to every well wisher of his country to see a fleet on which the safety of these kingdoms depends, returning to port with healthy crews; and how afflicting the contrary, where numbers are perishing of this loathsome disease!

There are few or no symptoms in Scurvy, that require any particular treatment; for none can be alleviated without the general means of relief. Fomentations, the warm bath, &c. have been often tried for the rigid tendons, and hardness of the muscles, but without effect; stimulant applications have been equally unsuccessful. For the difficult breathing and tightness about the breast, blisters, and the whole train of expectorants are insufficient to relieve. Opium itself, our last and only refuge in other cases of acute pain, affords no refreshing sleep or ease to the scorbutic sufferer. We have heard much of
sudorifics

fudorifics opening the pores of the skin and softening the surface; but this is trifling with the complaint. It is only the produce of fresh vegetation, that can administer to him the reviving cordial; and a few lemons will do more in assuaging his anguish than the whole art of pharmacy.*

In curing this disease, however, every physician ought to have in view the state of his patient when he was seized with the Scurvy. If the constitution was weakened by preceding illness, a diet of restorative food, with the use of wine, will be more beneficial than on other occasions. Whatever symptoms of other complaints remain after those of Scurvy disappear, ought to be treated in the same manner as for the original disease to which they belong.

* Transports carrying troops abroad ought to be well provided with these articles.

In the year 1786, a dreadful Scurvy broke out among the Russian failors then living on shore at Cronstadt. These people were kept remarkable nasty, badly cloathed, their lodgings very dirty, damp, and imperfectly aired. They had no particular hard duty, for the ships were laid up for the winter. Their diet consisted mostly of a species of pudding, not made of the most wholesome grain, salt fish, but not often flesh meats, and no fresh vegetables of any kind. About the end of February, when they had lived in this manner for four months, the Scurvy made its appearance. To such an alarming degree did it rage, that the Empress sent her own physician to inquire into its causes, and give the directions necessary to check its progress. At that season of the year, I apprehend no lemons or oranges could be procured in Cronstadt; for the principal remedy was a berry found in these countries, very much resembling our cranberry, and was, probably, nothing else. The disease,

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however,

however, continued to rage in some degree till the middle of summer, and it was not till pot herbs became very plentiful that it ceased altogether. This account was given me by Mr. Harris, now surgeon of the Aquilon; at that time a surgeon in her Imperial Majesty's service, who attended the sailors at Cronstadt.

Mr. Harris put into my hands Doctor Backeracht's Practical Dissertation on the Scurvy for the use of the Surgeons in the Russian Army and Navy.* After some general remarks on the disease, Doctor Backeracht gives us his opinion concerning the principal and other occasional causes of Scurvy. Humidity, he says, is the principal predisposing cause of Scurvy, that is the body being long exposed to a damp and moist atmosphere; but there must be other

* Dissertation pratique sur le Scorbût pour l'usage des Chirurgiens de l'Armée et de la flotte Imperiale Russe, traduite de l'allemand sur l'original du Dr. Henri Backeracht, Conseiller Actuel du college et Premier Medecin de la Flotte Imperiale.—Reval 1787.

secondary

secondary causes, he adds, concurring to give activity to the effects of humidity in order to produce the disease.

These are the following:—1mo. A cold and long winter; 2do. provisions of a bad quality; 3tio. hard labour and long continued; 4to. deficiency of cloathing; 5to. bad lodgings; 6to. the excess of spiritous liquors. In his account we find the predisposing and occasional causes very improperly confounded; and it is easily seen from whose authority Doctor Backeracht has been led to lay so much stress upon humidity. I have thought myself fully authorized by all I have read or seen of the disease in question to draw this final conclusion, that it can only occur in situations where there is a *deficiency of fresh vegetable matter*. The Imperial Physician also tells us, that it is during the use of provisions of a bad quality, without being joined with vegetables to correct them; “*such* “*as fresh cabbage, acids, roots of any kind, as*

"*potatoes, &c.*" that Scurvy arises. Having ascribed so much as he had done to the situation and climate of Russia, he is greatly embarrassed about its production in the mild climate of Cherfon, from whence a Colonel of the army had written to him, that his regiment was very much afflicted with Scurvy. This port, he says, is situated in a climate where the winter is neither long nor rigorous, for the cold is very moderate. In trying to reconcile seeming contradictions, it is unfortunate for a man to overlook the only circumstance that can do it. Had Doctor Backeracht allowed due weight to the deficiency of fresh herbs or fruits, he could have been at no loss in explaining the occurrence in any climate or situation.

What is delivered in this Work concerning the Prevention of Scurvy is very little applicable to the same purpose in our navy. Such scenes of filth and nastiness as described, are not to be found in any British man of war;
and

and the diet of our seamen would be a feast to a Russian sailor.

In his treatment of the disease a multitude of Formulæ are given; and his indications of cure are founded chiefly on obsolete theories. Speaking of pains in the breast and side, with difficult respiration, he says, "Bleeding and
" blisters in that case are not only without any
" utility, but hurtful in a high degree, although
" all these appearances indicate an inflammation
" of the breast. I have found attended with
" great success, bags filled with the emollient
" herbs boiled in vinegar applied continually to
" the breast, and anointed twice a day with
" camphorated sweet oil of almonds: every hour
" the patient took two spoonfuls of the follow-
" ing mixture:

R Gum. Guajac	Drachm. i
— Arab.	Drachm. ii
Aq. fœnicul	Unc. vi
Oxymel Scillit	Unc. i.
M.	For

“ For common drink he took a decoction of
“ the roots of marsh mallows, with simple oxy-
“ mel.” This practice needs no comment; it
will certainly never be imitated by British Navy
surgeons, if they can get fresh fruits or herbs.

The Earth Bath, as it is called, has been said
to give very material relief to the contracted
hams and hardened limbs of scorbutics, by
softening the skin and promoting perspiration.
This practice has undeservedly gained credit
like some others; for when you can command
an Earth Bath, fresh vegetables can be also pro-
cured: so that if it happened to be used while
they were served to the patient, the bath has
been commended for the cure, and the vegeta-
bles forgot; but we have no fact to assure us
that it ever cured the Scurvy by itself. The
custom seems to have originated from the sailors
burying their limbs in warm sand on the shore,
from

from which they apprehended some ease was procured.*

It would lead us into a very fruitless criticism to recount the different medicines met with in books, and their pretended effects in the cure of Scurvy: we are sorry to see some late valuable publications disfigured by the introduction of insignificant remedies.—The fact cannot be too often repeated, and strictly attended to; that nothing is to be depended upon for the cure of Scurvy, but vegetables in a *recent* state, and these will be found to be the more valuable, as they approach and possess an *acid quality*.

Having given a particular description of the Scurvy as it occurred in a slave ship; it is a

* This was first practised by the sailors in Admiral Hosier's fleet.

tribute due to humanity to offer some means of prevention suited to these situations.

The most knowing in this trade are aware of how much consequence it is to complete their numbers as soon as possible; therefore a ship that is fitted to carry from three hundred to three hundred and fifty slaves, is preferable to a larger one, as less endangering their health, from confinement in the ship, and lying long on the coast. The diet should be in no greater proportion than to keep them in good condition. Ships in the road of Anamaboe, at the time we were buying our Negroes, had them as long on board, but by pampering them less, preserved them healthy and free from Scurvy. This spare diet should be continued till they are about to leave the coast, when it may be increased. The utmost attention ought to be paid to the qualities of their food: the corn rooms ought to be very often inspected, and

airy

airy as possible; the corn, rice, and beans ought to be carried frequently on deck, to prevent them growing damp and mouldy. These articles need a great deal of boiling to render them easy of solution in the stomach, and Guinea pepper may be mixed with them in large quantity: it is seldom they complain of their food being too hot; as it is one of the best condiments for a vegetable diet, there can be no doubt, but it must obviate many complaints of the bowels that are apt to follow such flatulent fare. Palm oil is another condiment used by the natives of Africa in great quantities; for it certainly very much assists the assimilation of the chyle, and increases in a high degree the nutritive qualities of vegetables. The fruits of the climate, such as pine apples, lemons, oranges, whenever they can be procured, may be distributed among them. On leaving the coast a ship ought to be well provided with all the fruits and vegetables in season. The passage of a Guineaman to the West Indies, is seldom so long, but lemons,

H h

limes,

limes, and oranges may be preserved all the way; but if there is danger of a long passage, the juice can be preserved in bottles well corked as formerly directed. There are many instances, where, from a scarcity of water in long passages, the Scurvy seemed to make its appearance when very little expected; in these situations a few casks of lime juice, might have saved some thousand pounds to the owners, and the lives of the poor wretches who perished. Exercise is of the greatest importance in preserving the health of the slaves, and no more ought to be shackled than what the safety of the vessel requires. They may likewise be encouraged to dance, which, besides the exercise it affords, tends to amuse them; diverts their ideas, and makes them more cheerful; but all this must be done by gentle means: the lash of a cat-and-ninetails may force a man to run and leap about, but the feelings will brood over the smart afterwards. For throwing fresh air into the rooms, windsails are much preferable to the small skuttles in the
side

side of the ship, because they are generally shut at sea when the rooms are most full. The decks and platforms below where the slaves lie, ought to be kept as dry and clean as possible; after being washed great care should be taken to have them well dried with stoves while the slaves are on deck, for any dampness would be hurtful. To all these rules it is necessary to add, that the most lenient means should be employed to keep them in order; great address is often wanted on such occasions; but severities are substituted, and few think that they are trampling on the Rights of a Man and a Brother!

F I N I S.

ERRATA.

Page xiv. lege *Nullius addictus jurare in ver-
ba magistri*

Page. Line.

63	2	lege <i>Stoical</i>
93	4	<i>for to, lege for</i>
164	15	<i>lege effected</i>
211	note,	lege <i>Humanum</i>
221	18	<i>lege affected</i>
231	19	<i>lege expectorants.</i>



